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# Linux

## For Beginners

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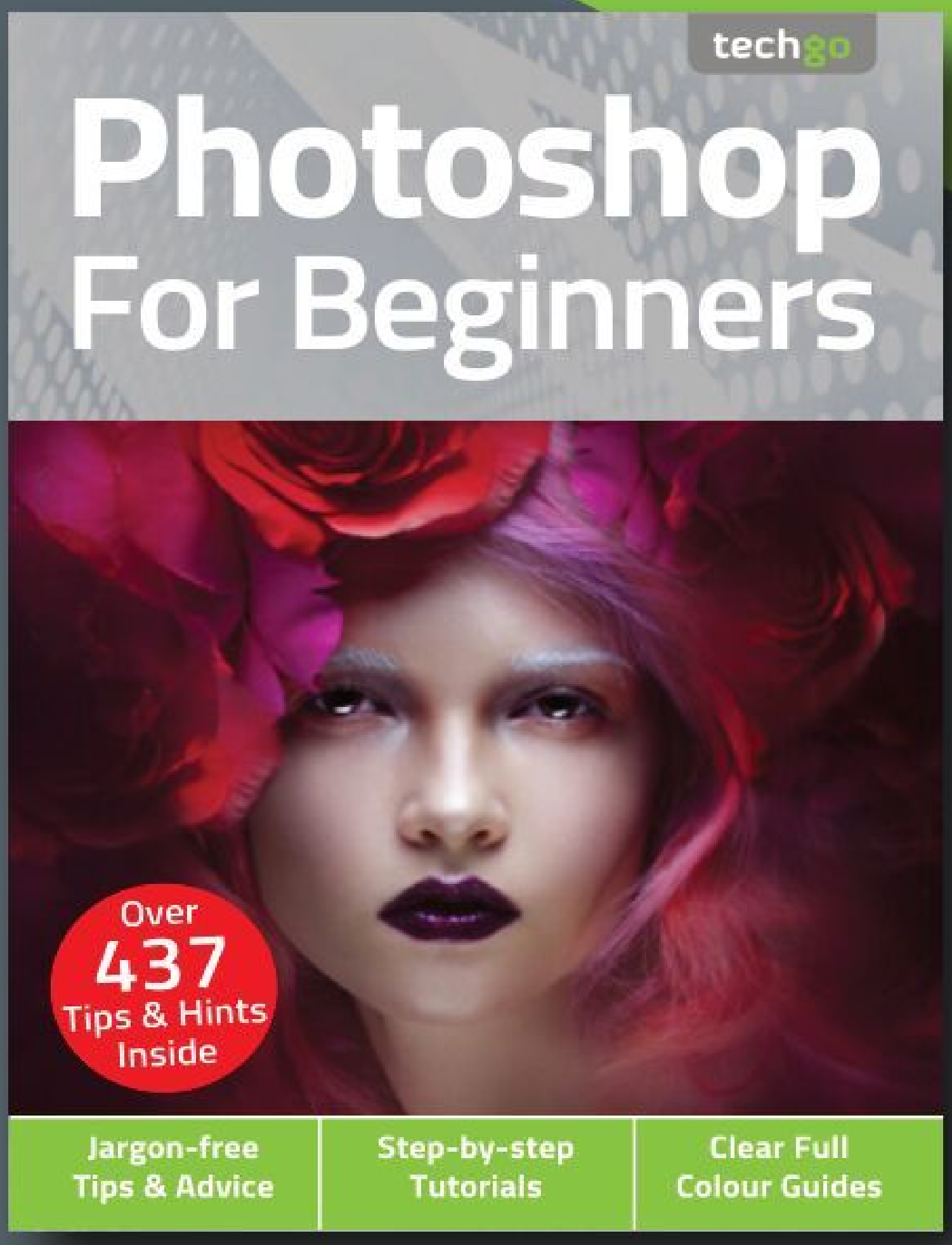
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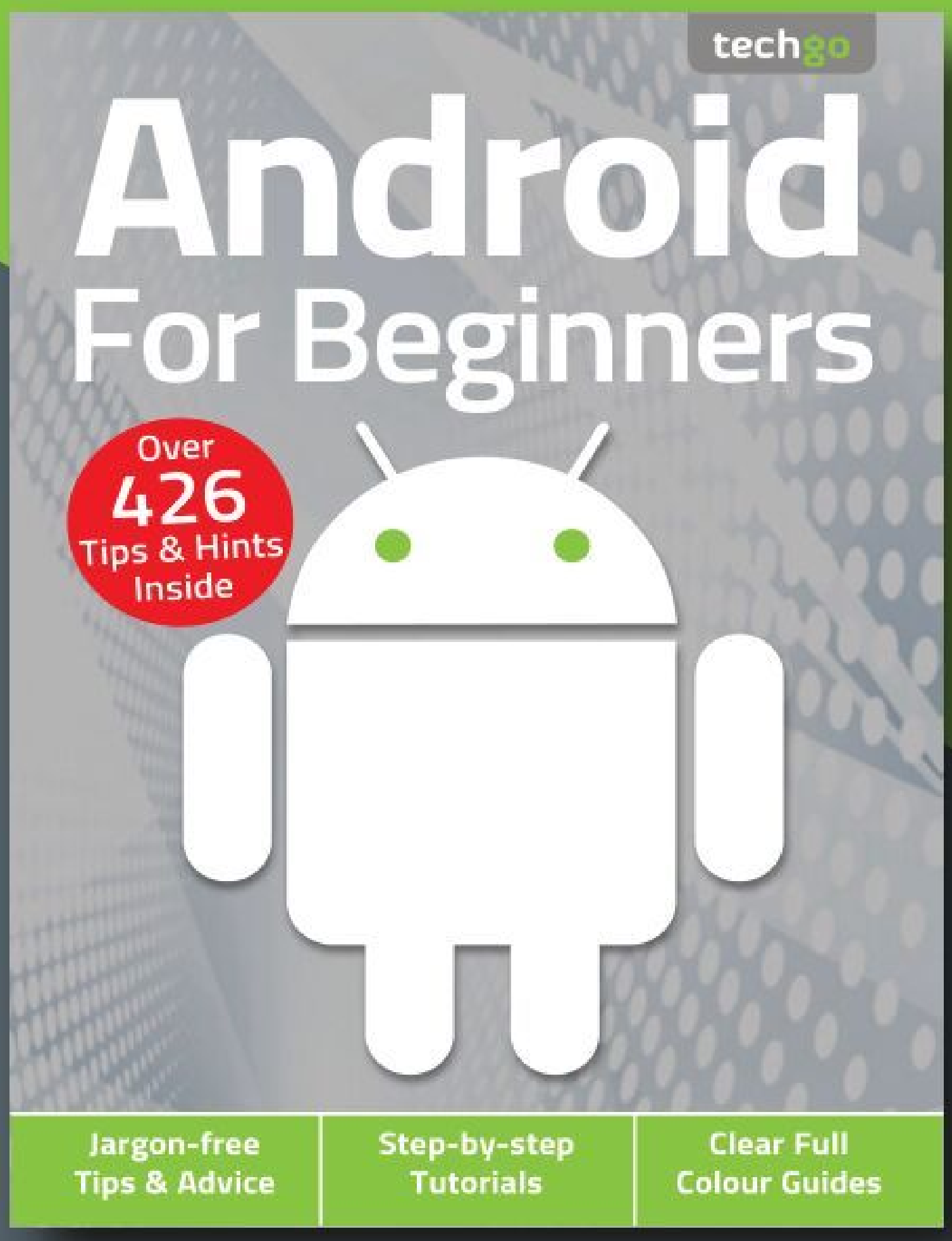
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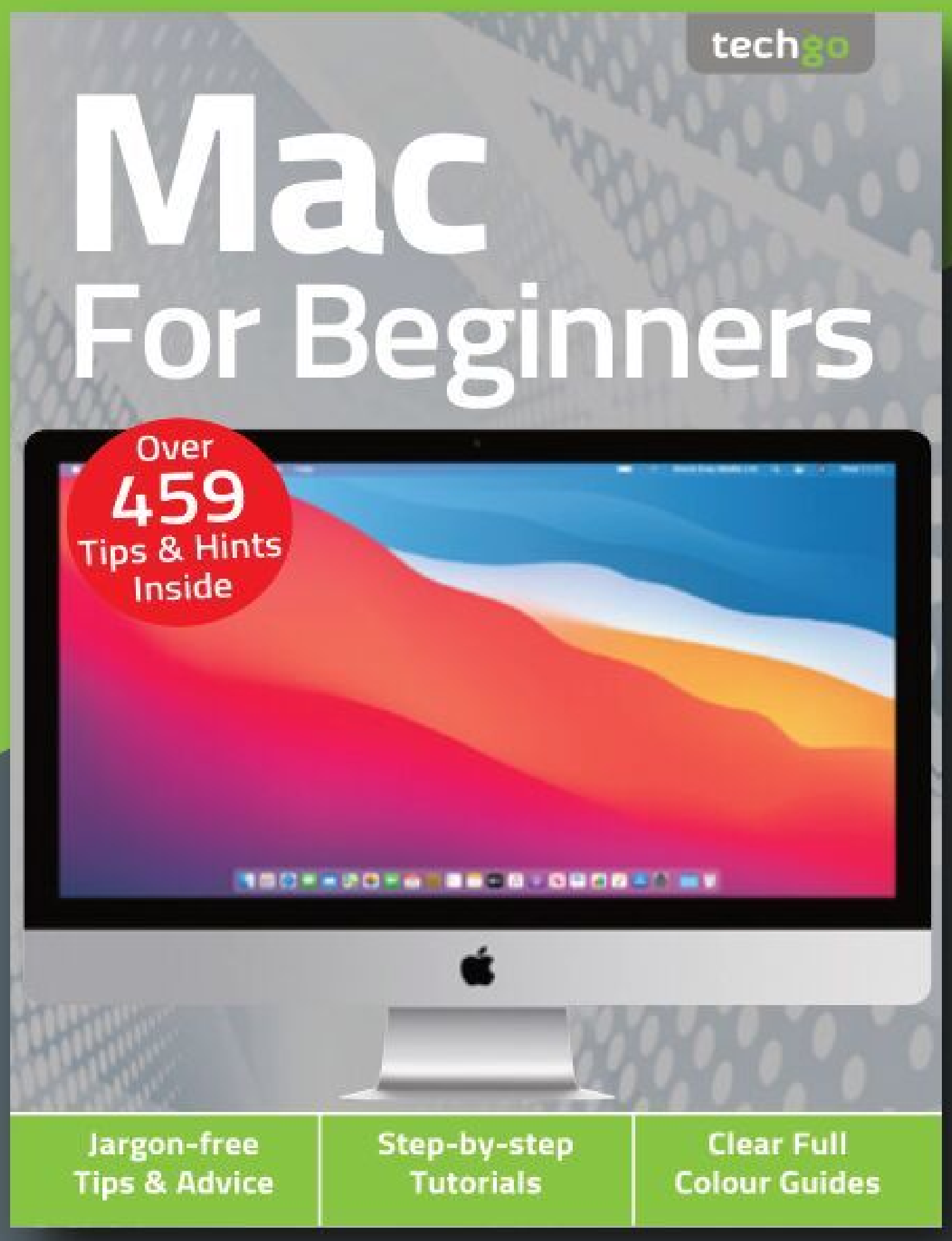
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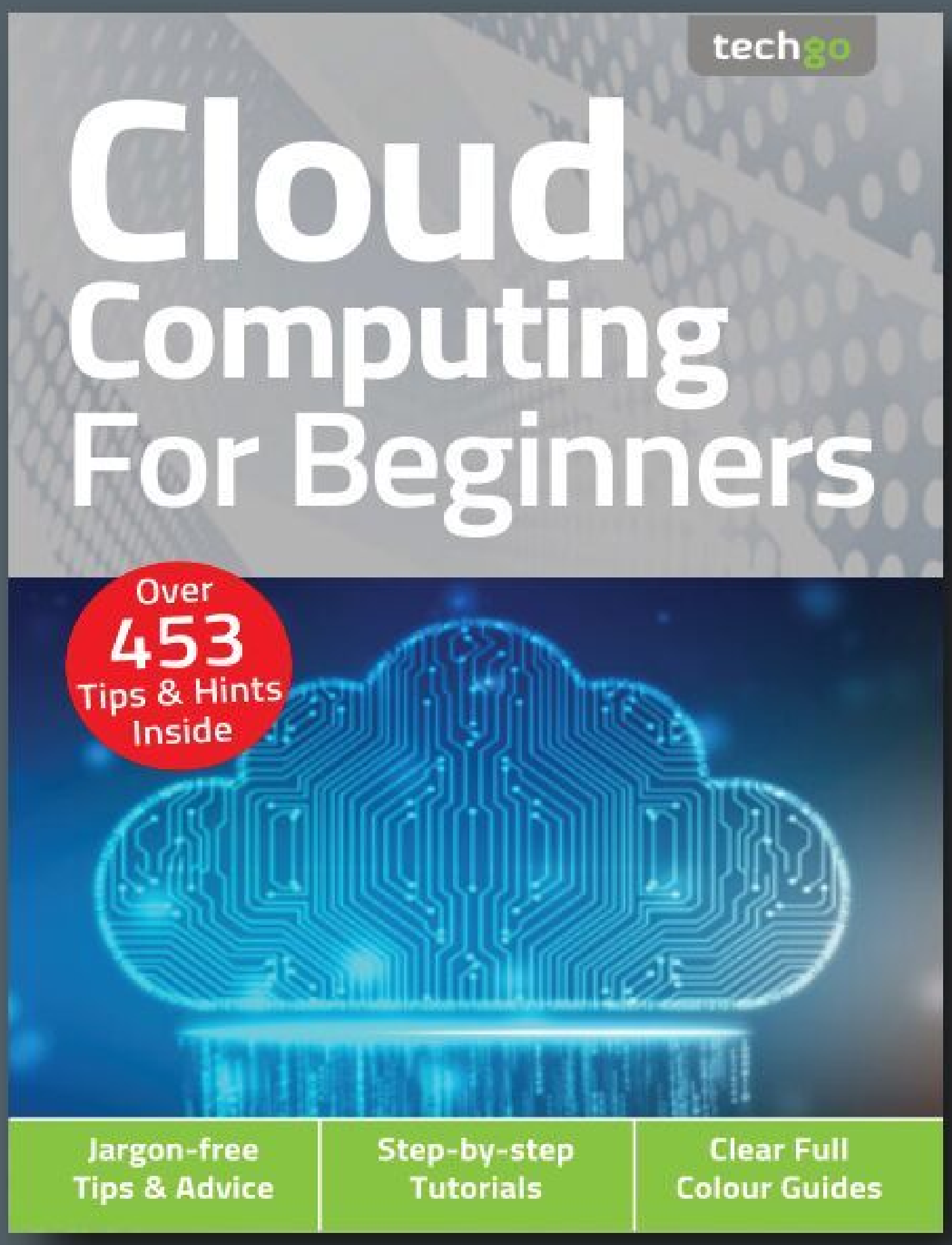
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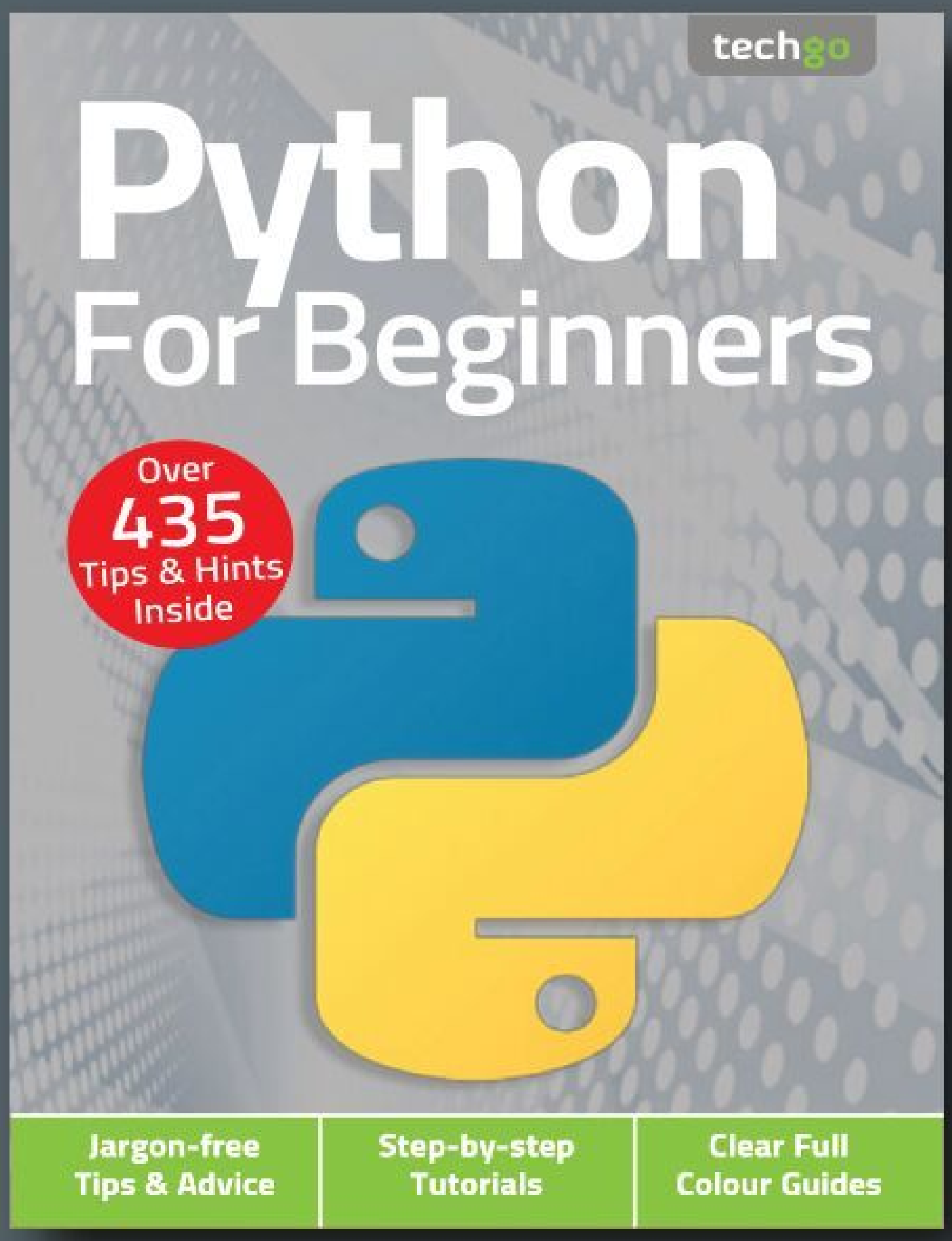
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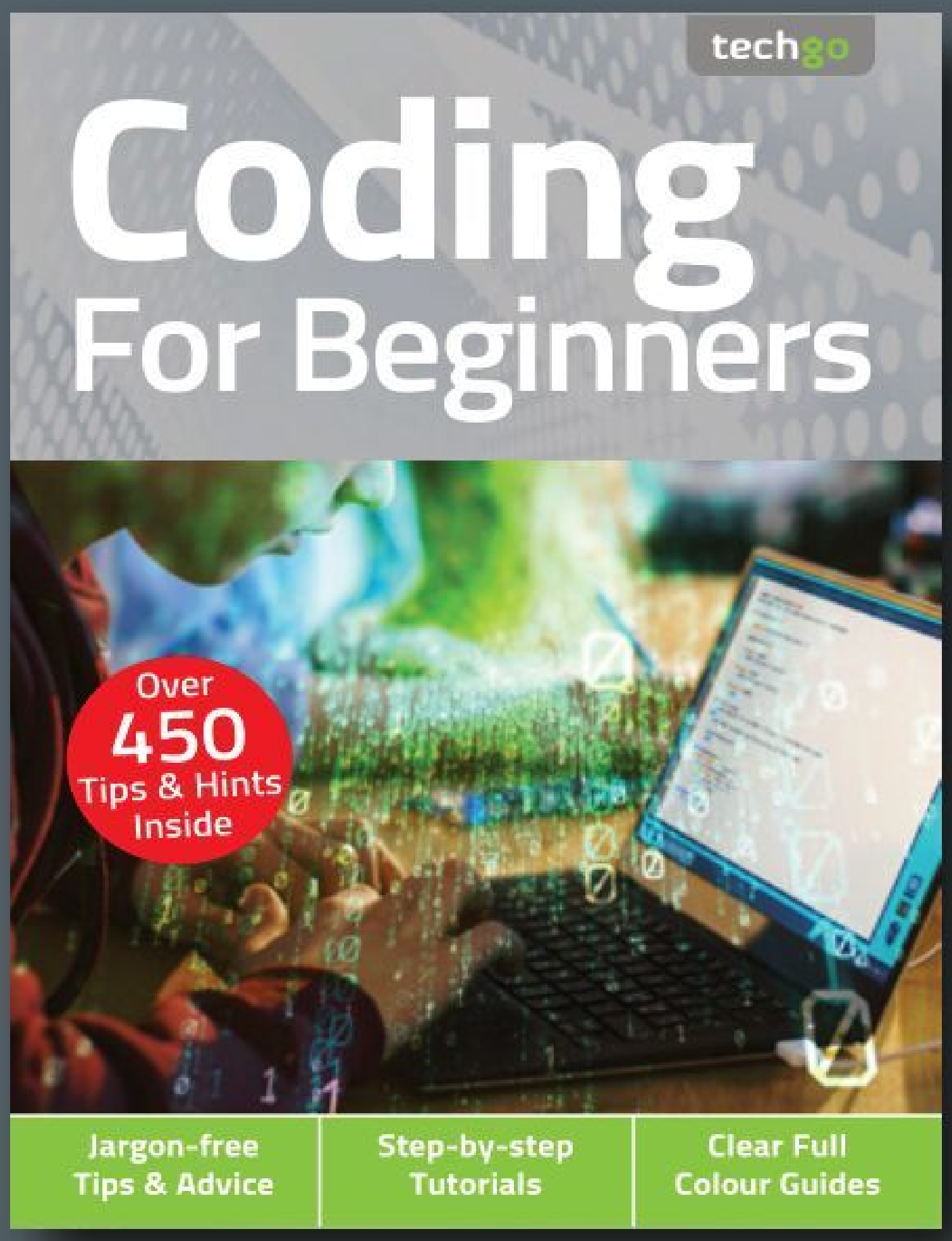
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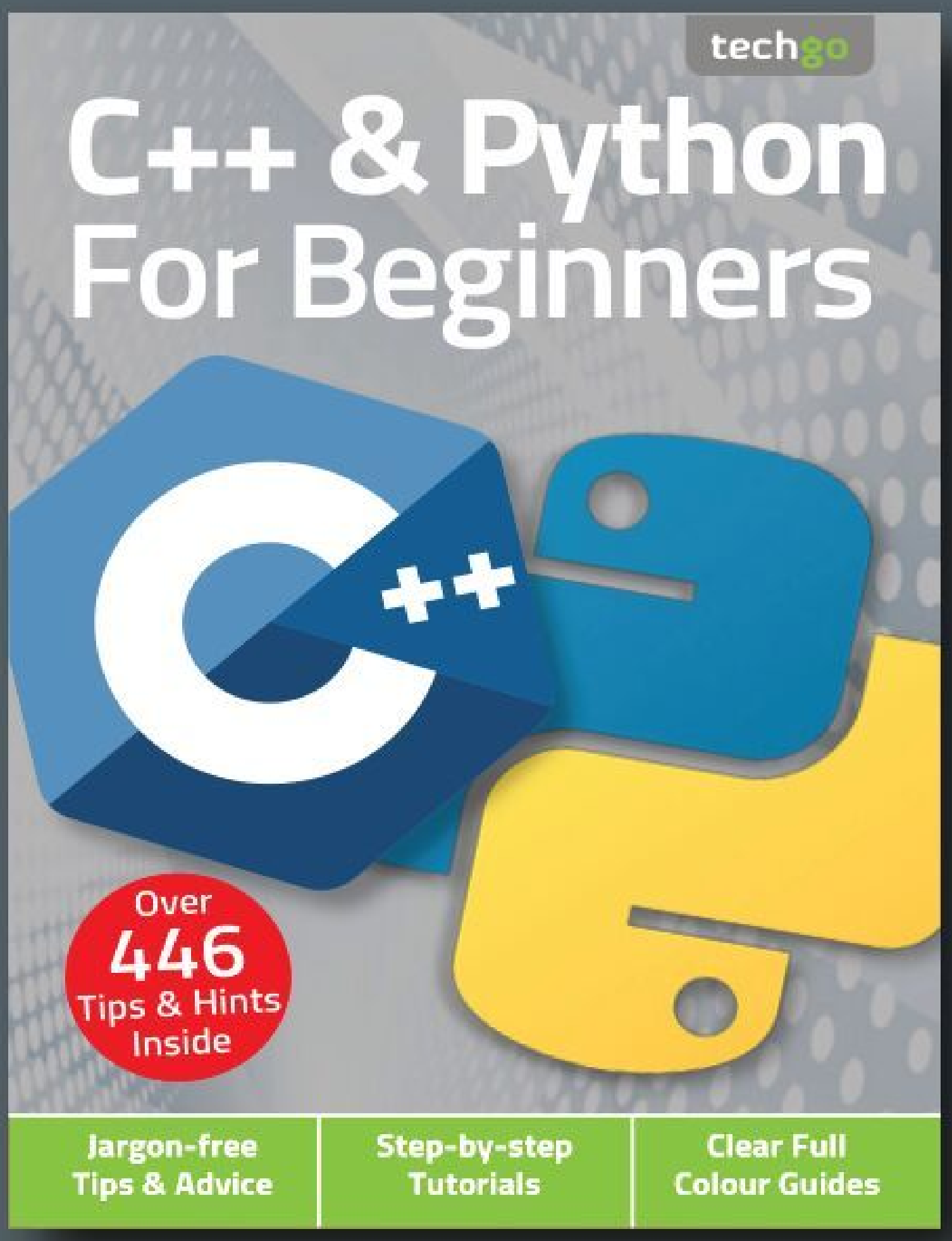
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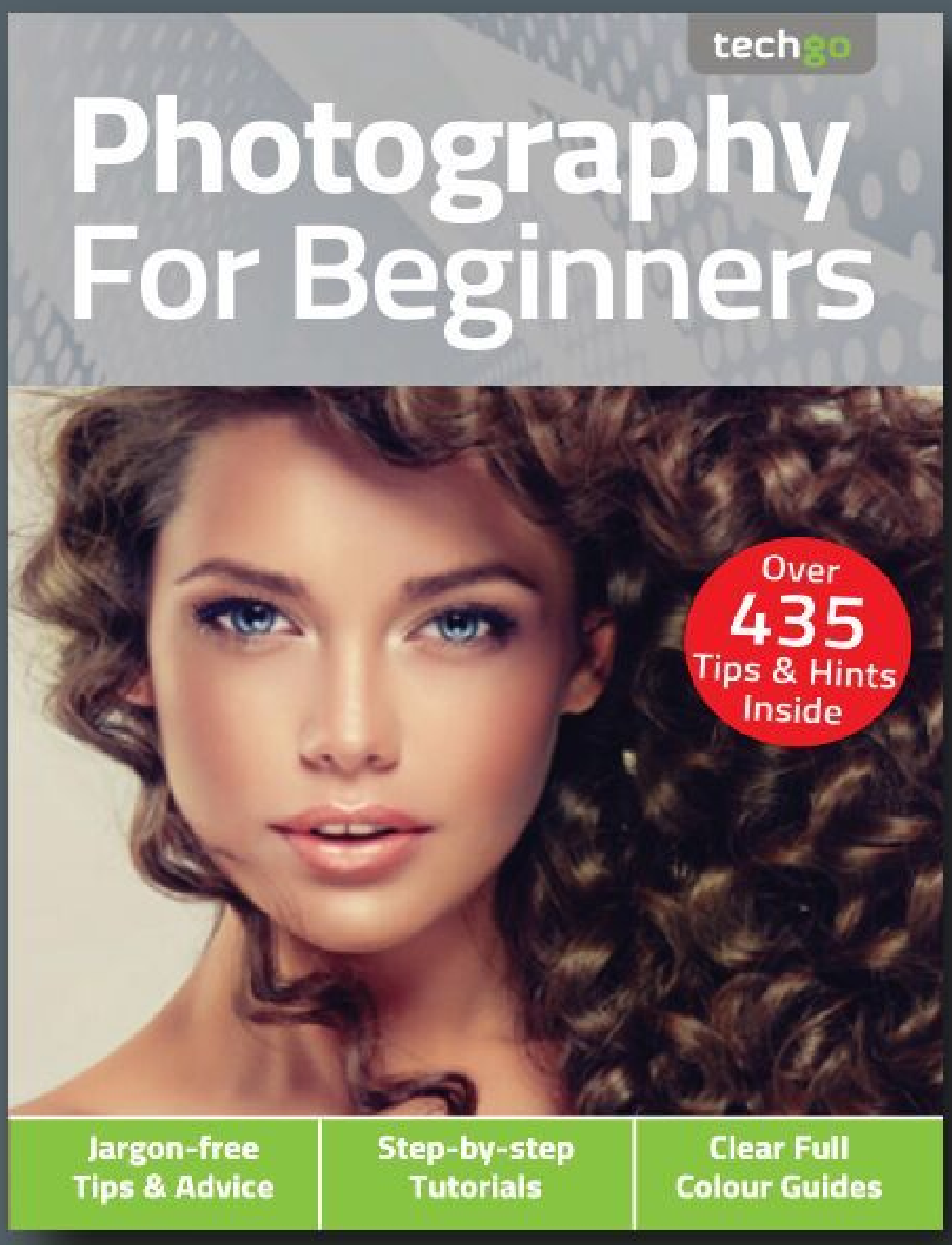
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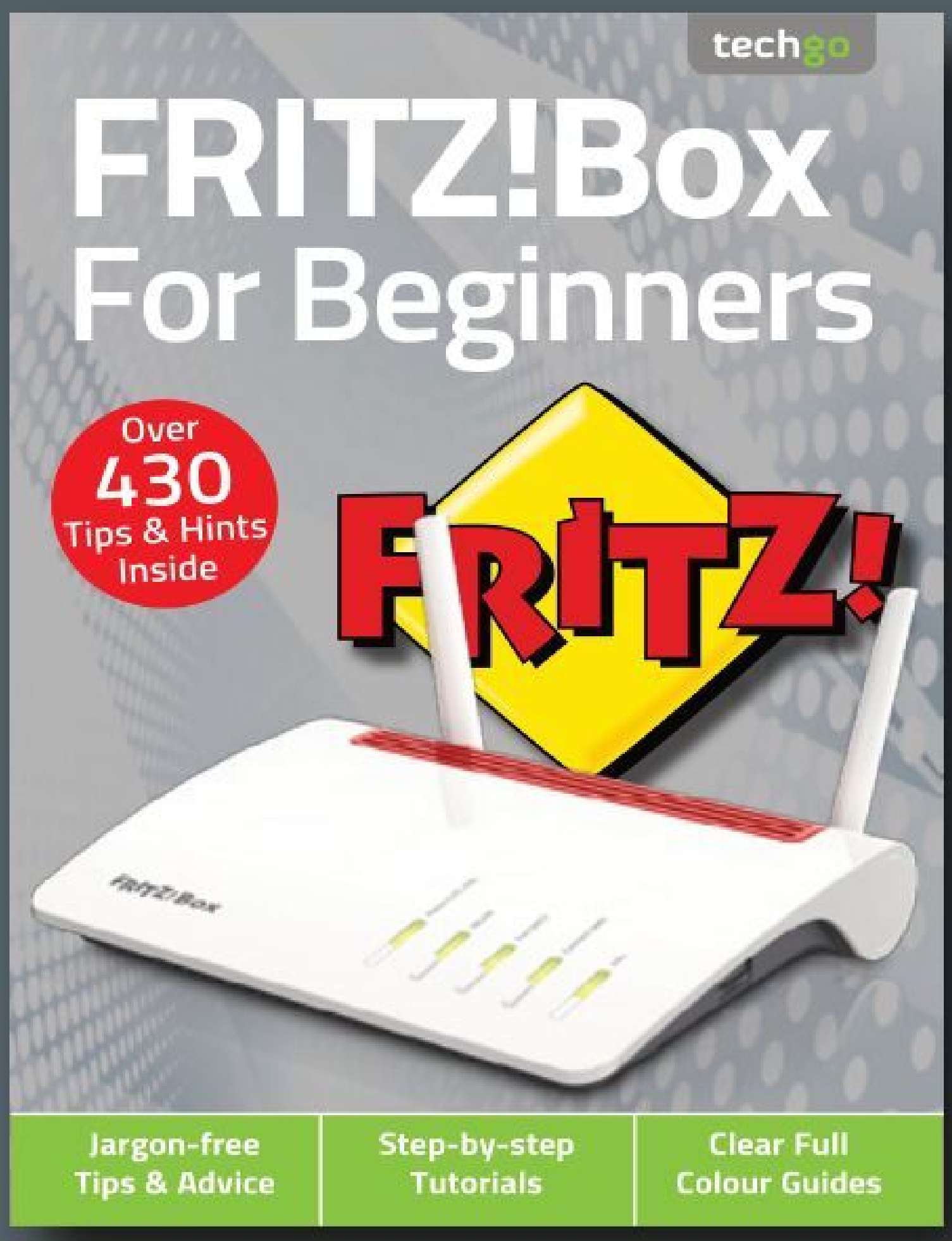
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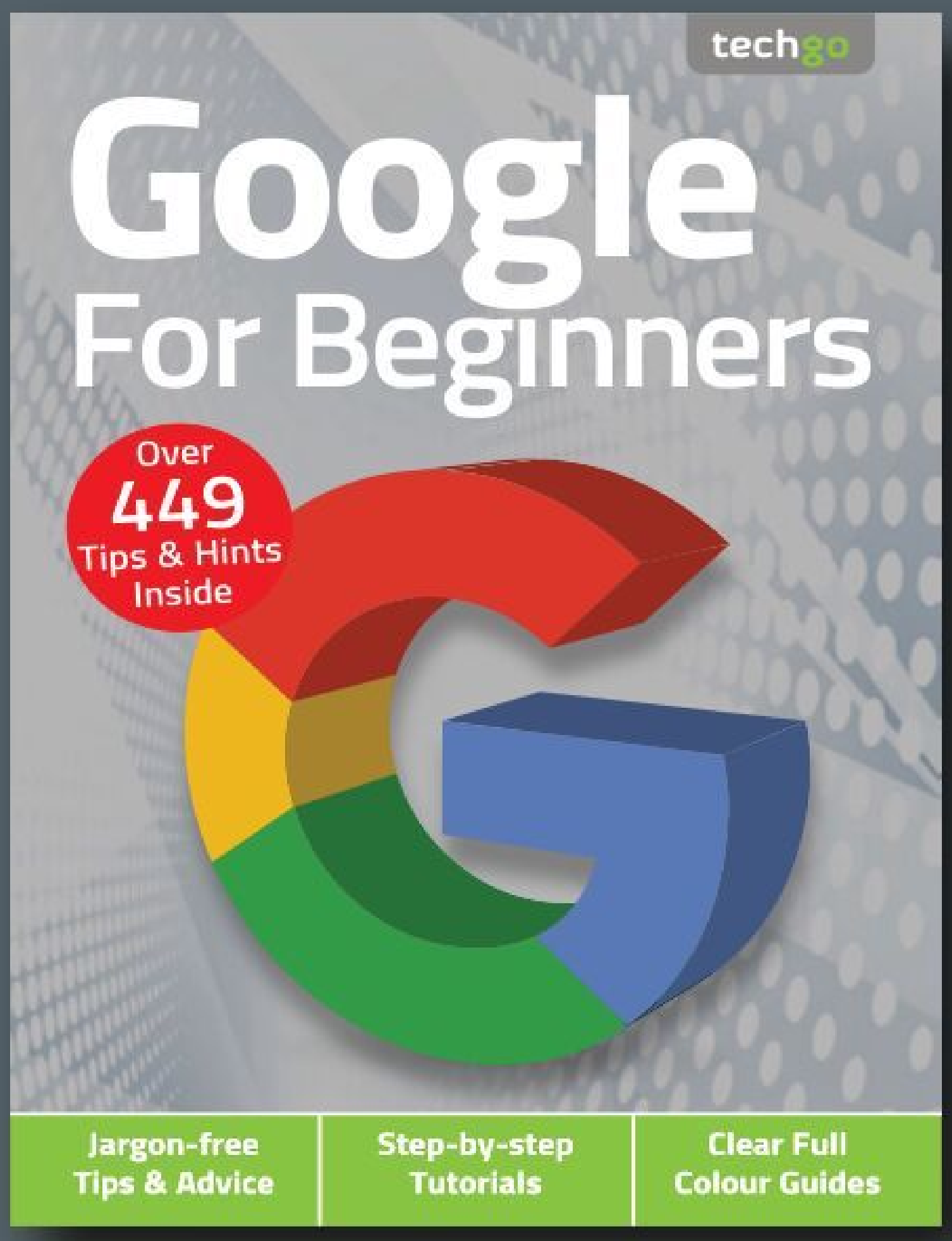
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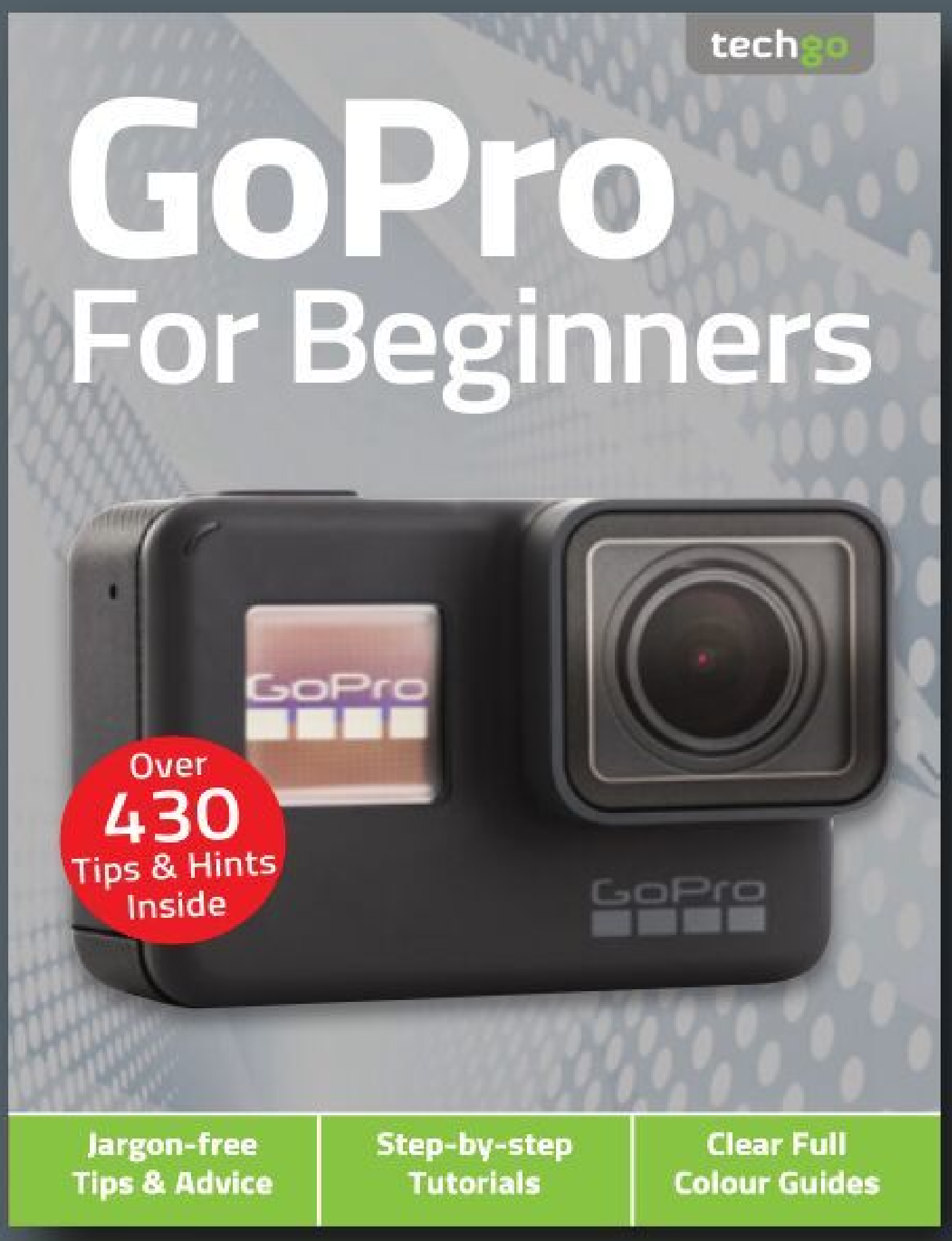
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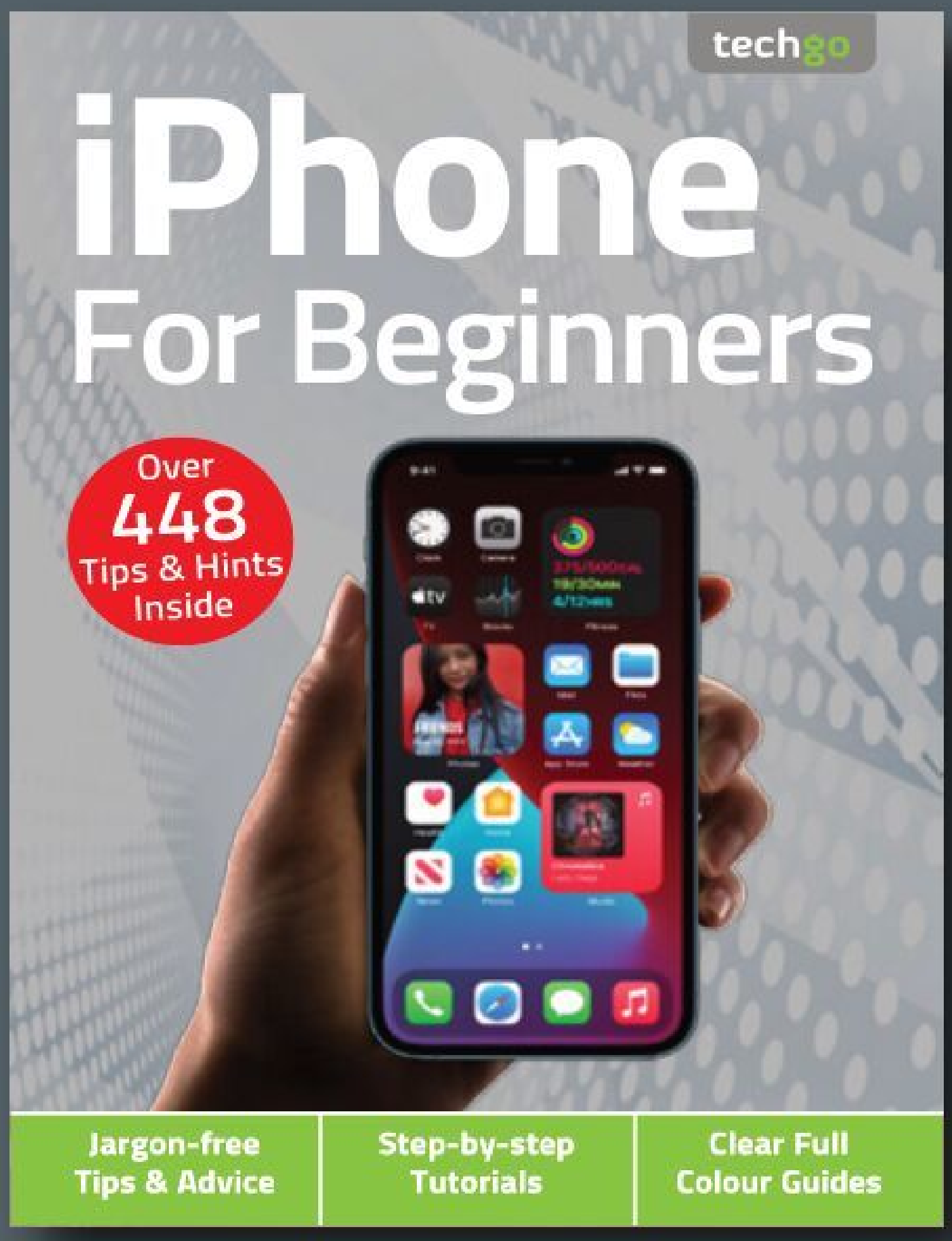
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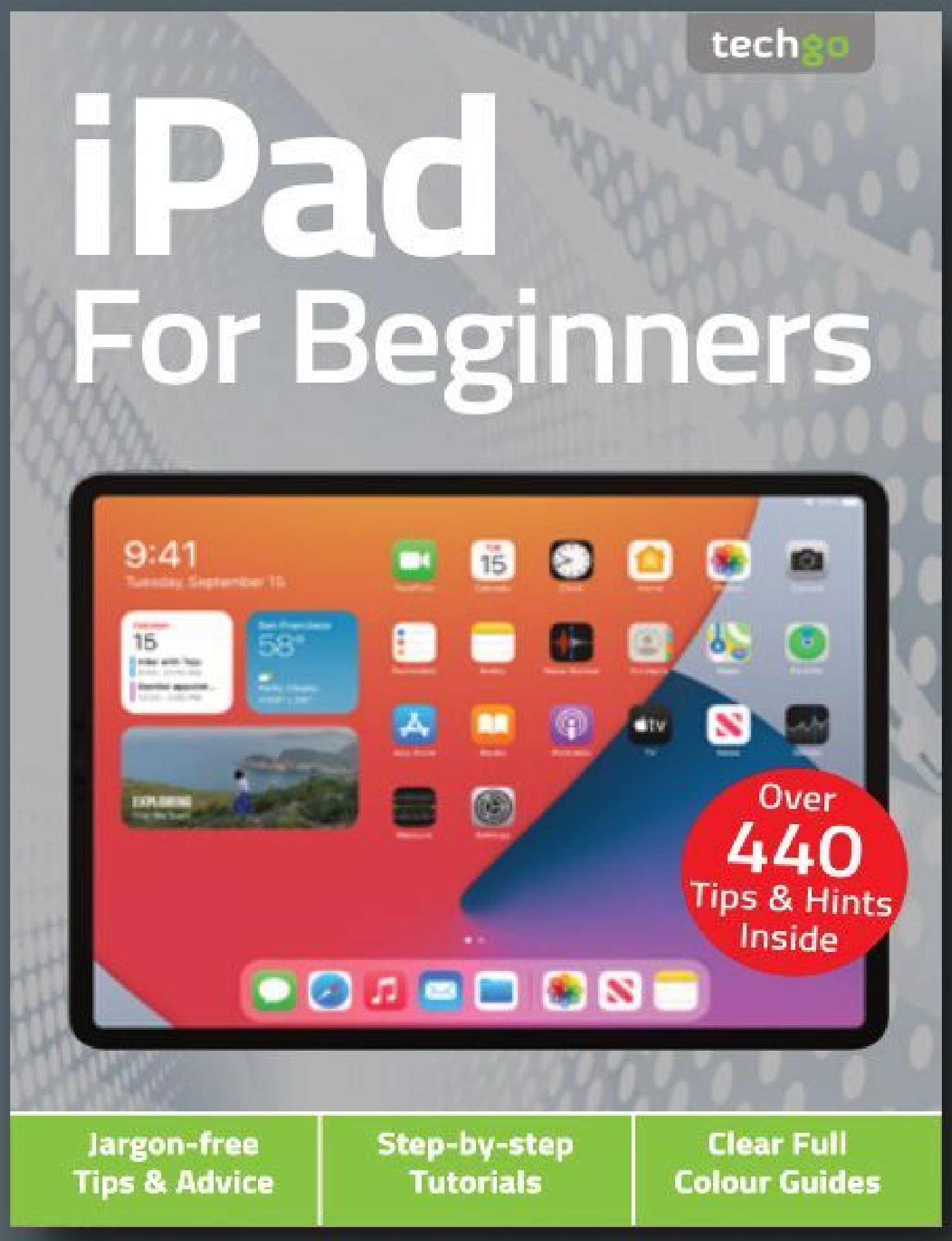
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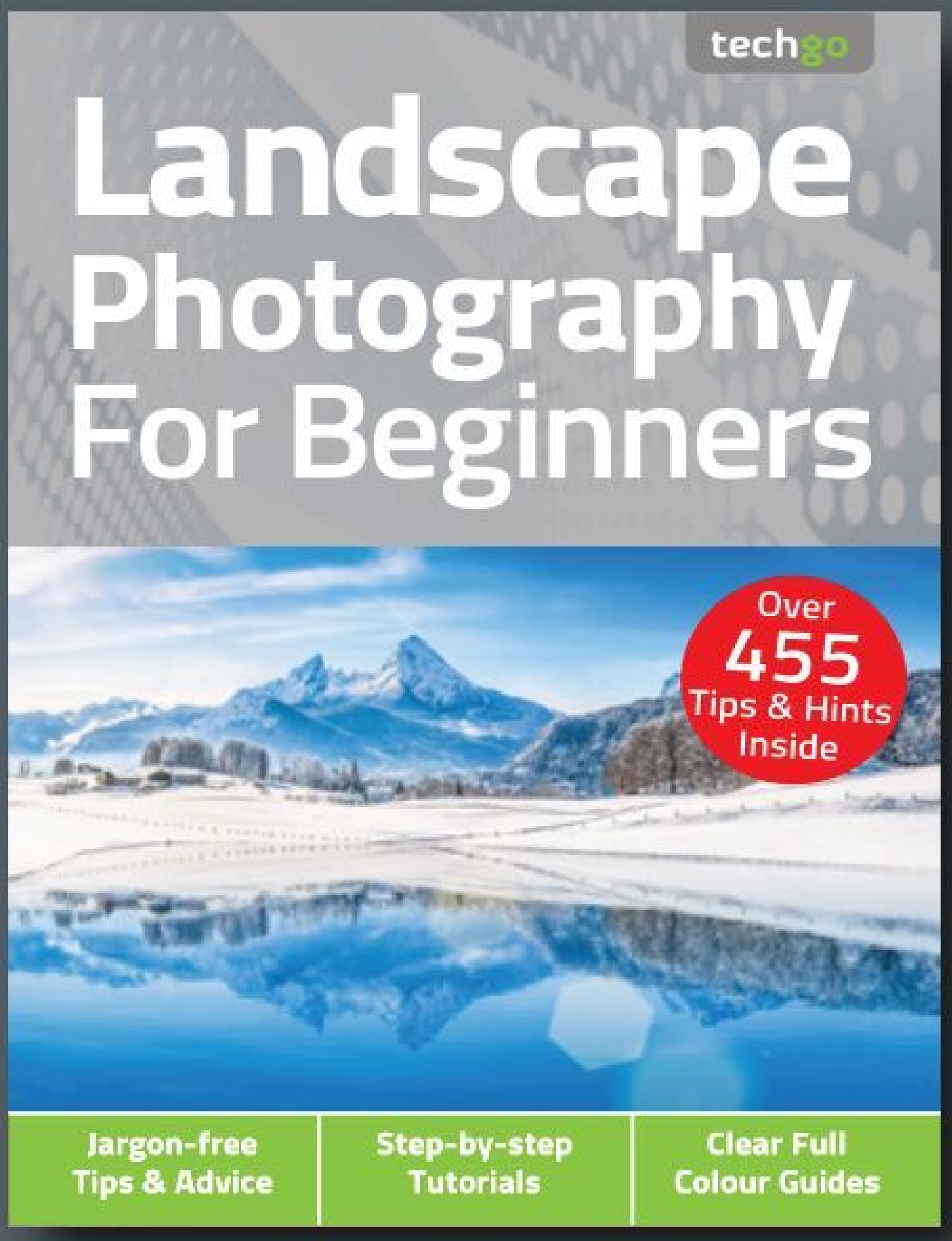
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# The Complete Linux Manual

> "That's what makes Linux so good: you put in something and that effort multiplies. It's a positive feedback cycle."
>
> *– Linus Torvalds (developer of the Linux kernel)*

Linux is everywhere. It powers the Internet as the main operating system behind the Web's servers, it powers spacecraft, it's the operating system for the fastest supercomputers in the world and it's used in smart TVs and mobile devices. Why? Because it's ultra stable, lightning fast and completely free of charge.

However, there's more to Linux than simply being a free to use operating system. Its unique configuration allows the user to customise and personalise the OS into any form they wish. A Linux user can change their OS look and feel from one day to the next, install thousands of freely available apps and programs and take back control of their computer.

Linux is about freedom. Freedom from the walled-garden approach of other restrictive operating systems, freedom to choose what you want on your computer, freedom to alter it and use it how you please. It's a worldwide community of like-minded users, all striving to get the best development from this incredible OS.

With this book, you too can become a part of the open community of Linux users. The tutorials within these pages will help you get to grips with Linux, show you how it works, what you can do with it and how you can code with it to take your Linux experience to even greater heights.

Discover Linux. Discover freedom.

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BDM's Code Portal
60+ Python programs
21,500+ lines of code
Master Python with the help of our fantastic Code Portal, featuring code for games, tools and more.
Visit: https://bdmpublications.com/code-portal, and log in to get access!

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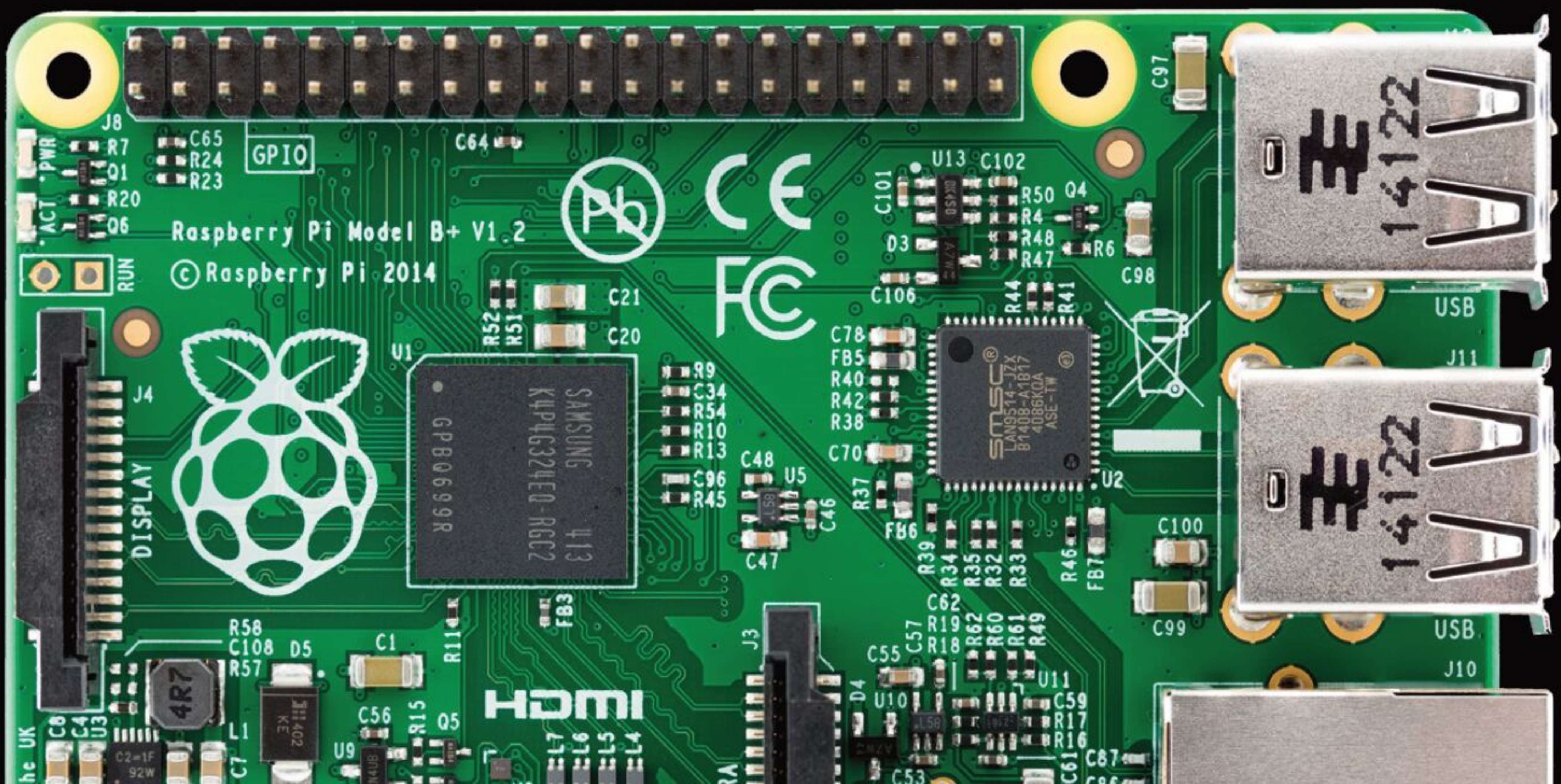

*"With this book, you too can become a part of the open community of Linux users. The tutorials within these pages will help you get to grips with Linux, show you how it works, what you can do with it and how you can code with it to take your Linux experience to even greater heights."*

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> "How did you know so much about computers?"
>
> "I didn't, it was the first one."
>
> – *Admiral Grace Hopper (pioneer programmer) when interviewed by David Letterman*

# Say Hello to Linux

Why Linux? What is it? Where do I get it? Why are there so many different versions of it? Most beginners ask these, and many more, questions when starting out. It's true that Linux is an incredibly versatile and powerful operating system but where do you start? Thankfully, you can find the answers in this section.

There is so much you can do with Linux but you need to know where to start; we're here to help you out. In this section you can learn what Linux is, what a distro is and what a desktop environment is. You can also begin to explore how Linux works and how it can work for you.

# Why Linux?

For many of its users, Linux means freedom. Freedom from the walled garden approach of other operating systems, freedom to change and use the OS as you please and freedom from any form of licensing or payment. There's a lot more to Linux than you may think though.

## FREE AND OPEN

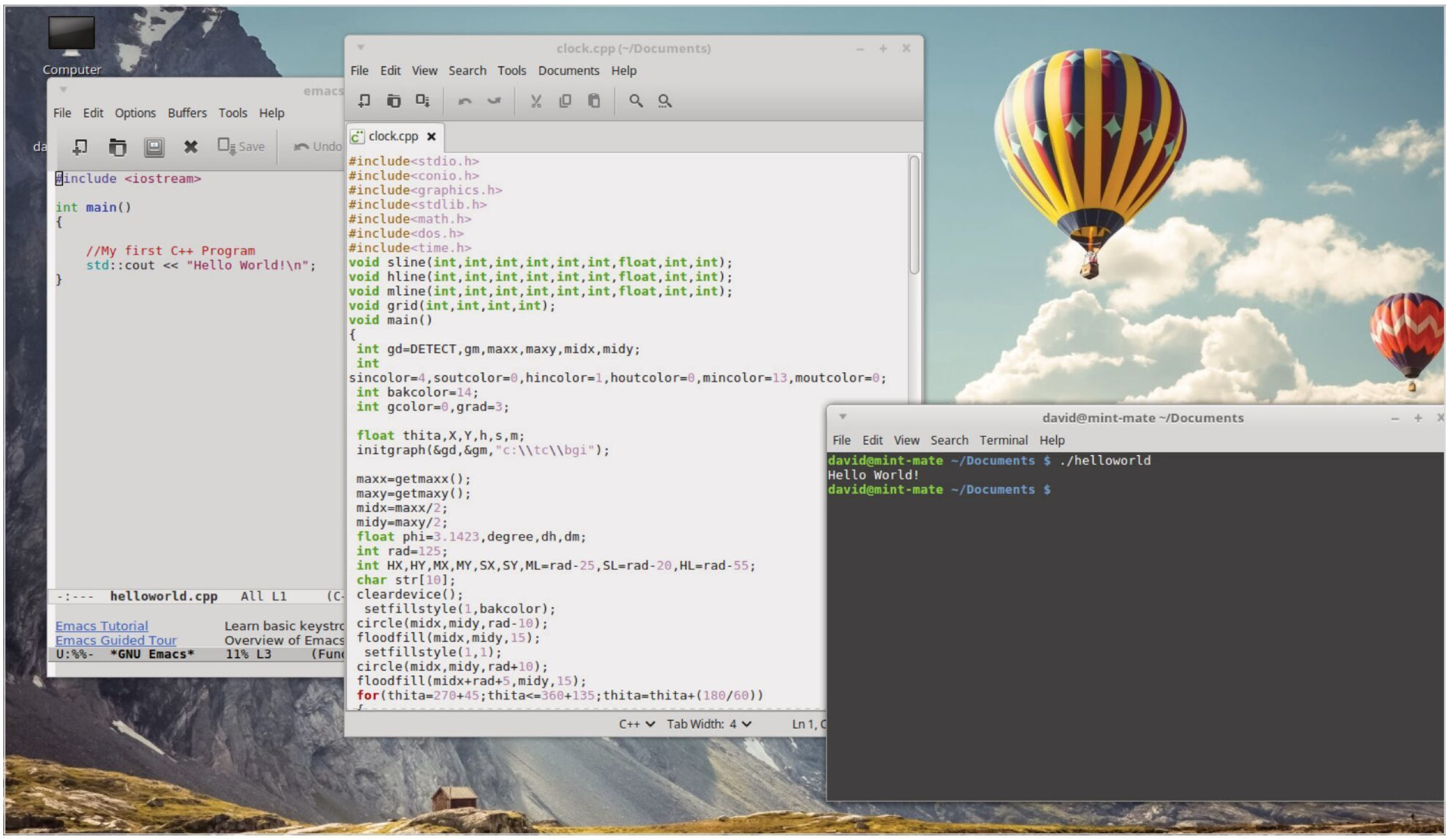
**Linux is a fantastic fit for those who want something different. The efficiency of the system, the availability of applications and stability are just a few good reasons.**

The first thing you need to know is that there is no such operating system called Linux. Linux is in fact the operating system kernel, the core component of an OS. When talking about Linux what we, and others, are referring to are one of the many distributions, or distros, that use the Linux kernel. No doubt you've heard of at least one of the current popular distros: Ubuntu, Linux Mint, Fedora, openSUSE, Debian, Raspbian, the list goes on. Each one of these distros offer something a little different for the user. While each has the Linux kernel at its core, they provide the user with a different looking desktop environment, different preloaded applications, different ways in which to update the system and get more apps installed and a slightly different look and feel throughout the entire system. However, at the centre lies Linux, which is why we say Linux.

Linux works considerably differently to Windows or macOS. It's free for a start: free to download, free to install on as many computers as you like, free to use for an unlimited amount of time and free to upgrade and extend with, equally, free programs and applications. This free to use element is one of the biggest draws for the developer. While a Windows license can cost up to £100, and a Mac considerably more, a user, be they a developer, gamer or someone who wants to put an older computer to use, can quickly download a distro and get to work in a matter of minutes.

Alongside the free to use aspect comes a level of freedom to customise and mould the system to your own uses. Each of the available distros available on the Internet have a certain 'spin',

**Linux is a great operating system on which to start coding.**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Save
Undo
-:--- helloworld.cpp All L1 (C-
Emacs Tutorial
Learn basic keystro
Emacs Guided Tour
Overview of Emacs
U:%%- *GNU Emacs* 11% L3 (Func
clock.cpp (~/Documents)
File Edit View Search Tools Documents Help
clock.cpp
C++ Tab Width: 4 Ln 1, C
david@mint-mate ~/Documents
File Edit View Search Terminal Help

```
#include <iostream>

int main()
{

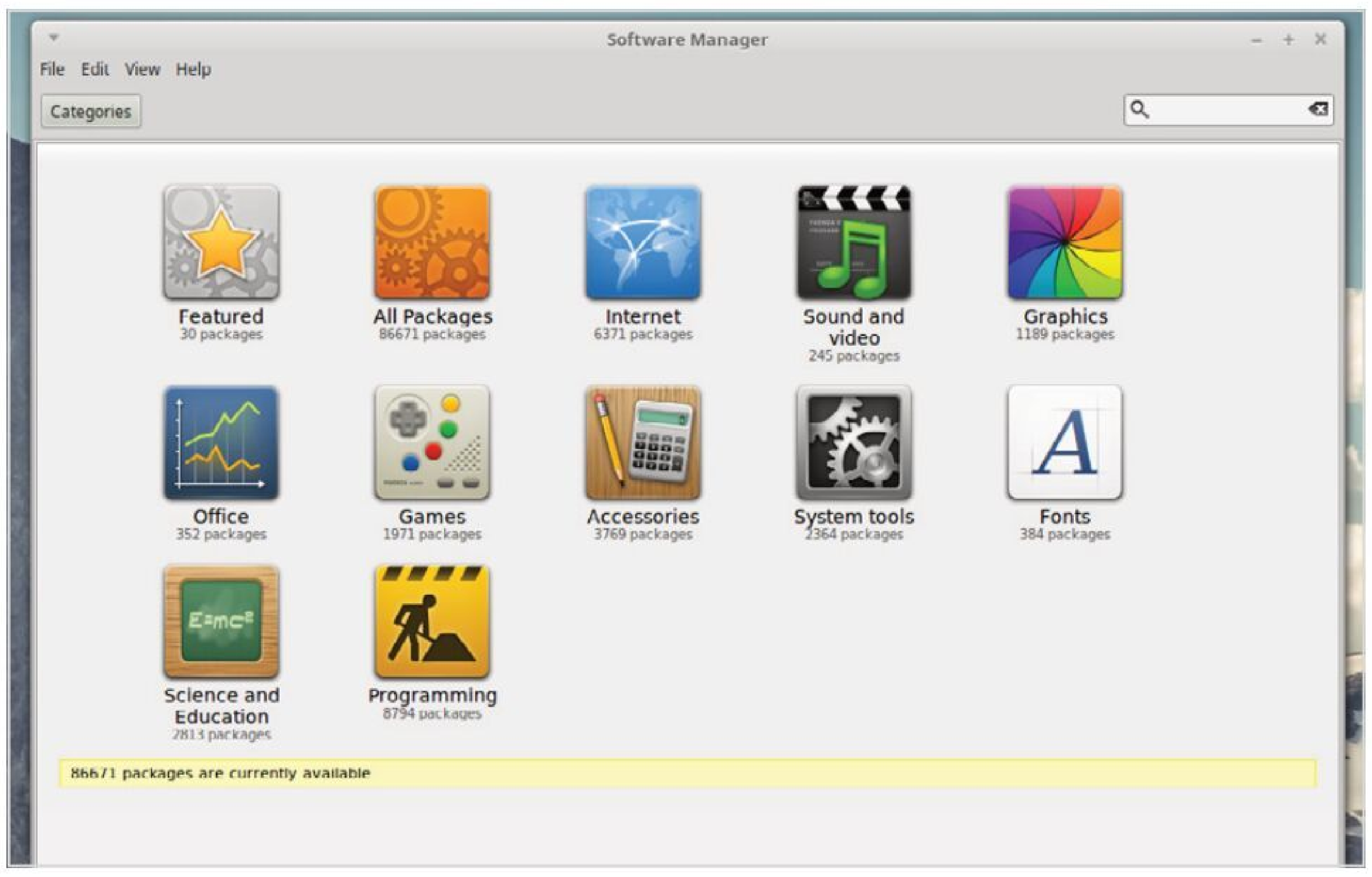
    //My first C++ Program
    std::cout << "Hello World!\n";
}
```

```
#include<stdio.h>
#include<conio.h>
#include<graphics.h>
#include<stdlib.h>
#include<math.h>
#include<dos.h>
#include<time.h>
void sline(int,int,int,int,int,int,float,int,int);
void hline(int,int,int,int,int,int,float,int,int);
void mline(int,int,int,int,int,int,float,int,int);
void grid(int,int,int,int);
void main()
{
 int gd=DETECT,gm,maxx,maxy,midx,midy;
 int
sincolor=4,soutcolor=0,hincolor=1,houtcolor=0,mincolor=13,moutcolor=0;
 int bakcolor=14;
 int gcolor=0,grad=3;

 float thita,X,Y,h,s,m;
 initgraph(&gd,&gm,"c:\\tc\\bgi");

 maxx=getmaxx();
 maxy=getmaxy();
 midx=maxx/2;
 midy=maxy/2;
 float phi=3.1423,degree,dh,dm;
 int rad=125;
 int HX,HY,MX,MY,SX,SY,ML=rad-25,SL=rad-20,HL=rad-55;
 char str[10];
 cleardevice();
  setfillstyle(1,bakcolor);
 circle(midx,midy,rad-10);
 floodfill(midx,midy,15);
  setfillstyle(1,1);
 circle(midx,midy,rad+10);
 floodfill(midx+rad+5,midy,15);
 for(thita=270+45;thita<=360+135;thita=thita+(180/60))
```

```
david@mint-mate ~/Documents $ ./helloworld
Hello World!
david@mint-mate ~/Documents $
```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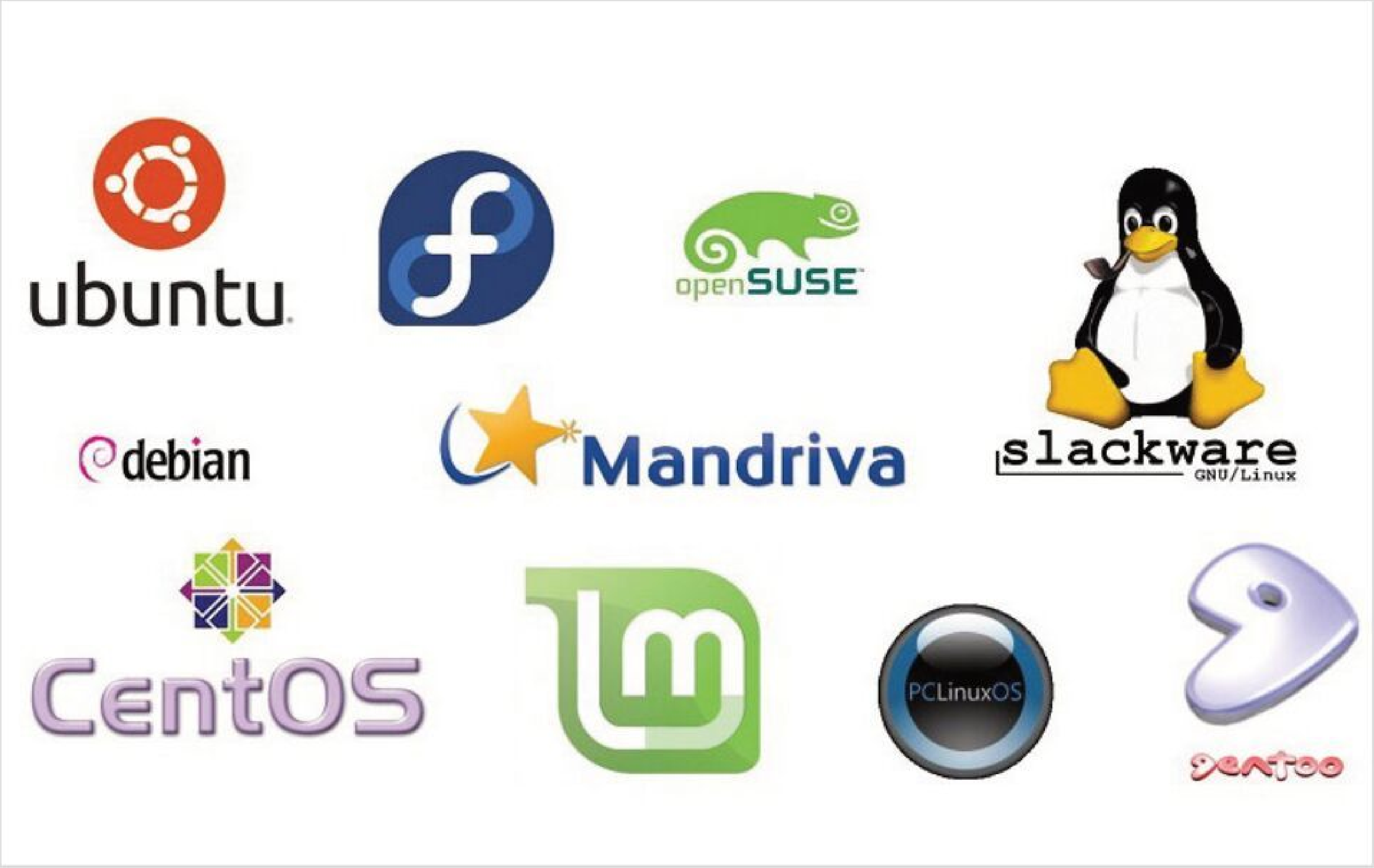
86671 packages
Internet
6371 packages
Sound and video
245 packages
Graphics
1189 packages
Office
352 packages
Games
1971 packages
Accessories
3769 packages
System tools
2364 packages
Fonts
384 packages
Science and Education
2813 packages
Programming
8794 packages
86671 packages are currently available

There are thousands of free packages available for programmers under Linux.


ubuntu
openSUSE
debian
Mandriva
slackware
GNU/Linux
CentOS
PCLinuxOS
gentoo

Each distro offers something unique to the user but all have Linux at the core.

in that some offer increased security, a fancy looking desktop, a gaming specific spin, or something directed toward students. This extensibility makes Linux a more desirable platform to use, as you can quickly mould the system into a development base, including many different kinds of IDEs for the likes of Python, web development, C++, Java and so on; or create a base for online anonymity, perhaps as a Minecraft server, media centre and much more.

Another remarkable advantage for those looking to learn how to code, is that Linux comes with most of the popular coding environments built in. Both Python and C++ are preinstalled in a high percentage of Linux distros available, which means you can start to program almost as soon as you install the system and boot it up for the first time.

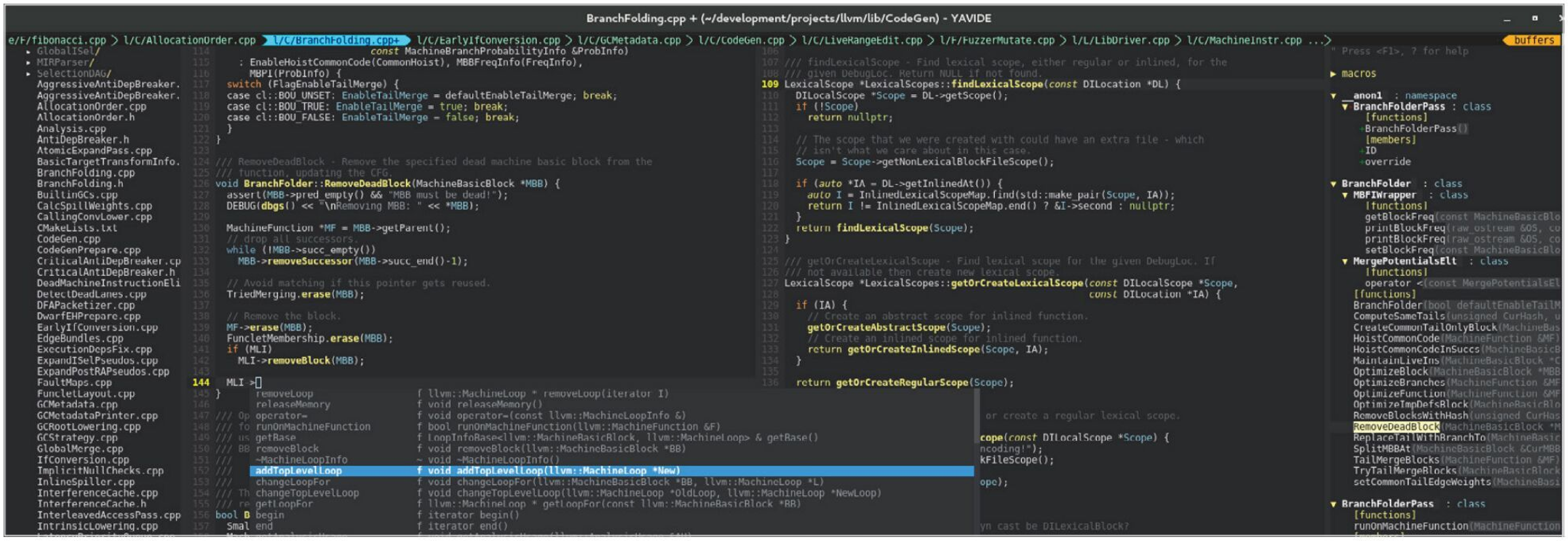
Generally speaking, Linux doesn't take up as many system resources as Windows or macOS; by system resources we mean memory, hard drive space and CPU load. The Linux code has been streamlined and is free from third-party 'bloatware' which hogs those systems resources. A more efficient system of course means more available resources for the coding and testing environment and the programs you eventually create. Less use of resources also means you can use Linux on older hardware that would normally struggle or even refuse to run the latest versions of Windows or macOS; so rather than throwing away an old computer, it can be reused with a Linux distro.

It's not all about C++, Python or any of the other more popular programming languages though. Using the command line of Linux, also called the Terminal, you're able to create Shell scripts, which are programs that are designed to run from the command line and made up of scripting languages. They are used mainly to automate tasks or offer the user some form of input and output for a certain operation.

Finally, although there are many more advantages we can list, there are thousands and thousands of free programs and apps available that cover nearly every aspect of computing. Known as packages, there are (at the time of writing) over 8,700 specific programming applications just on Linux Mint alone and an incredible 62,000+ overall packages catering for everything from Amateur Radio to WWW tools.

Linux then, is a great resource and environment for programming in. It's perfectly suited for developers and is continually improving and evolving. If you're serious about getting into coding, or you just want to try something new, give Linux a try and see how it works for you.

A Linux programming environment can be as simple or as complex as you need it to be.


BranchFolding.cpp + (~/development/projects/llvm/lib/CodeGen) - YAVIDE
buffers

# The Best Linux Distributions

There are lots of versions of Linux available, known as Distributions. Each has a different ethos and approach. Here are five great distributions to try and where you can get them.

## GOING LINUX

**The installation process for most distributions is similar. You download a disk image from the website and burn it to an optical disk or create a USB Flash Drive installer. Just be careful to get the right distribution for your hardware and read the instructions carefully.**

### LINUX MINT

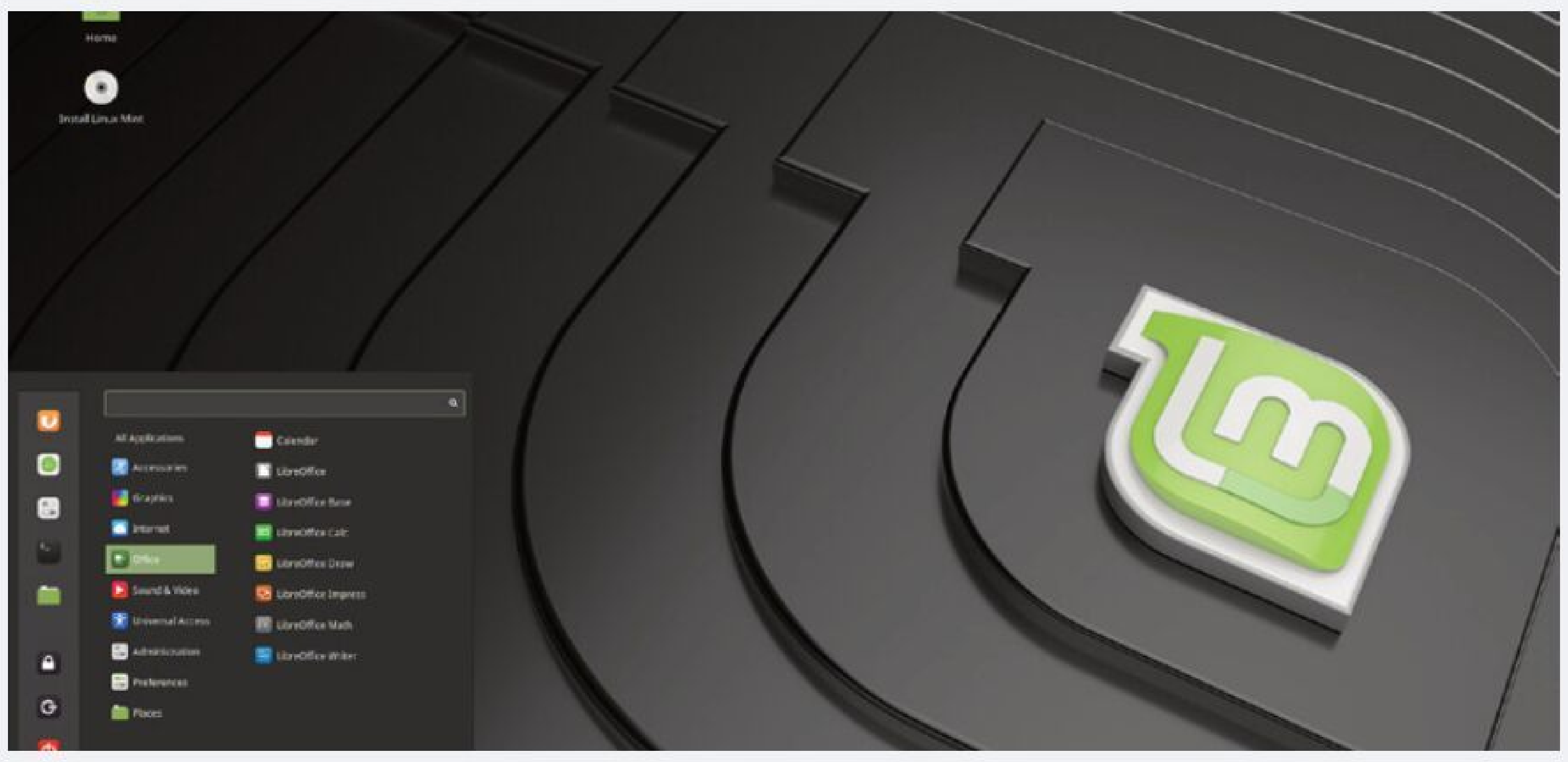
By far the most popular Linux distro (distribution) is Linux Mint. Mint began life back in 2006, as an alternative to the then most popular distro, Ubuntu. Although based on Ubuntu's Long Term Support build, Linux Mint took a different direction and offered the user a better overall experience.

Linux Mint has three main desktop versions available with each new version of the core OS it releases. This may sound confusing at first but it's quite simple. Currently, Linux Mint uses the Cinnamon Desktop Environment as its flagship model; there's MATE and Xfce models available too.

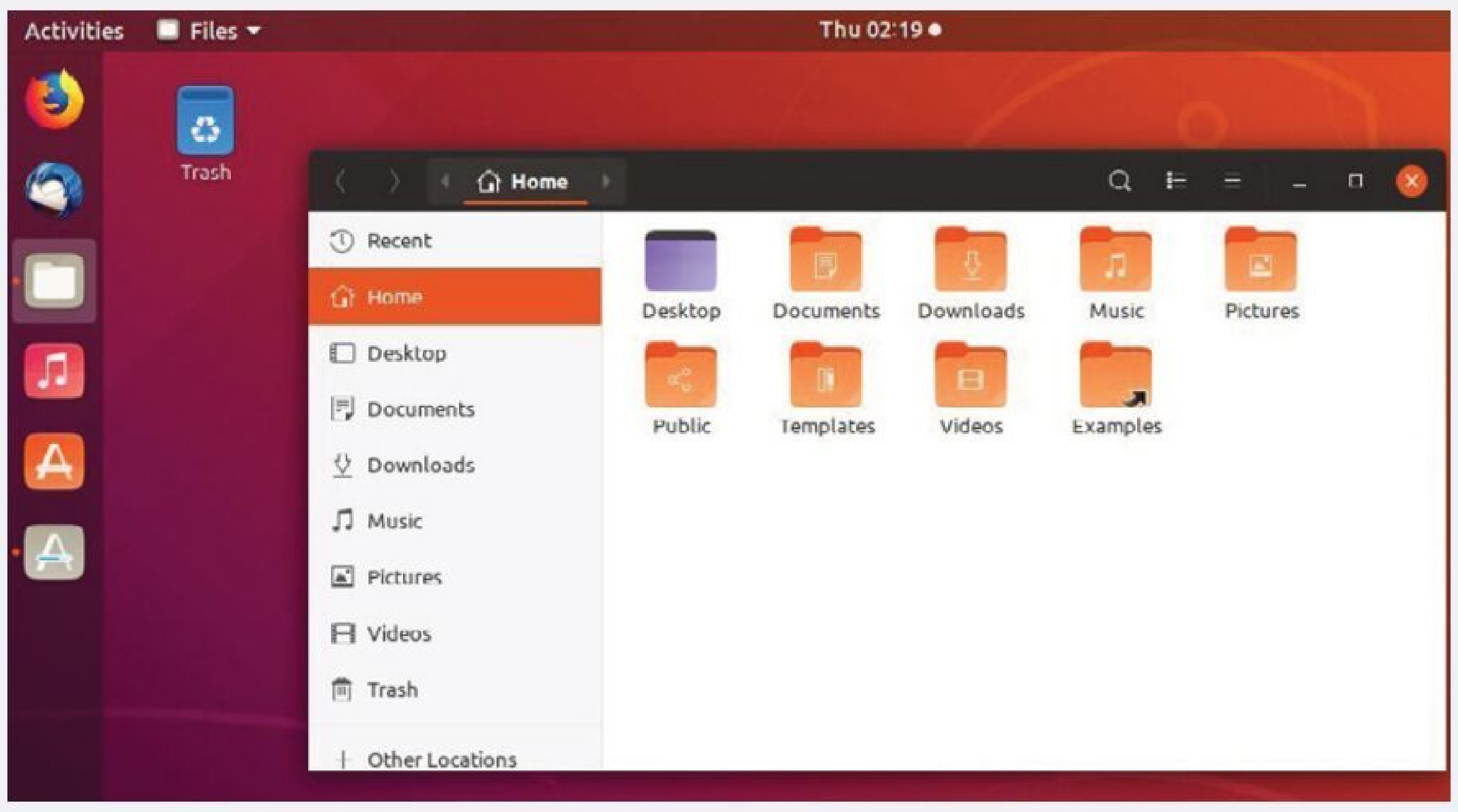
Cinnamon is a graphically rich desktop environment, MATE uses less fancy graphics, and is more stable on a wider variety of desktop systems, and Xfce is an extremely streamlined desktop environment that's built for speed and ultimate stability.

Throughout this title we'll be using the Cinnamon version; however, you can try out any of the other desktop environments as you wish. In fact, it's recommended that you do spend some time trying different environments, and even different distros, to see which suits you and your computer best.

**www.linuxmint.com**



### UBUNTU



The second most popular distro available is Ubuntu, which is an ancient African word meaning 'humanity to others'. Ubuntu's popularity has fluctuated over its fourteen year life. At one time, it was easily the most used Linux-based operating system in the world but some wrong choices along the way with regards to its presentation, and some unfavourable, controversial elements involving privacy, sadly saw it topple from the number one spot.

That said, Ubuntu has since made amends and is slowing crawling its way back up the Linux leader board. The latest versions of the OS use the GNOME 3 desktop environment, an impressive environment, although it can be a little confusing for former Windows users and is a little heavy on system resources, especially if you're planning on installing it on an older computer.

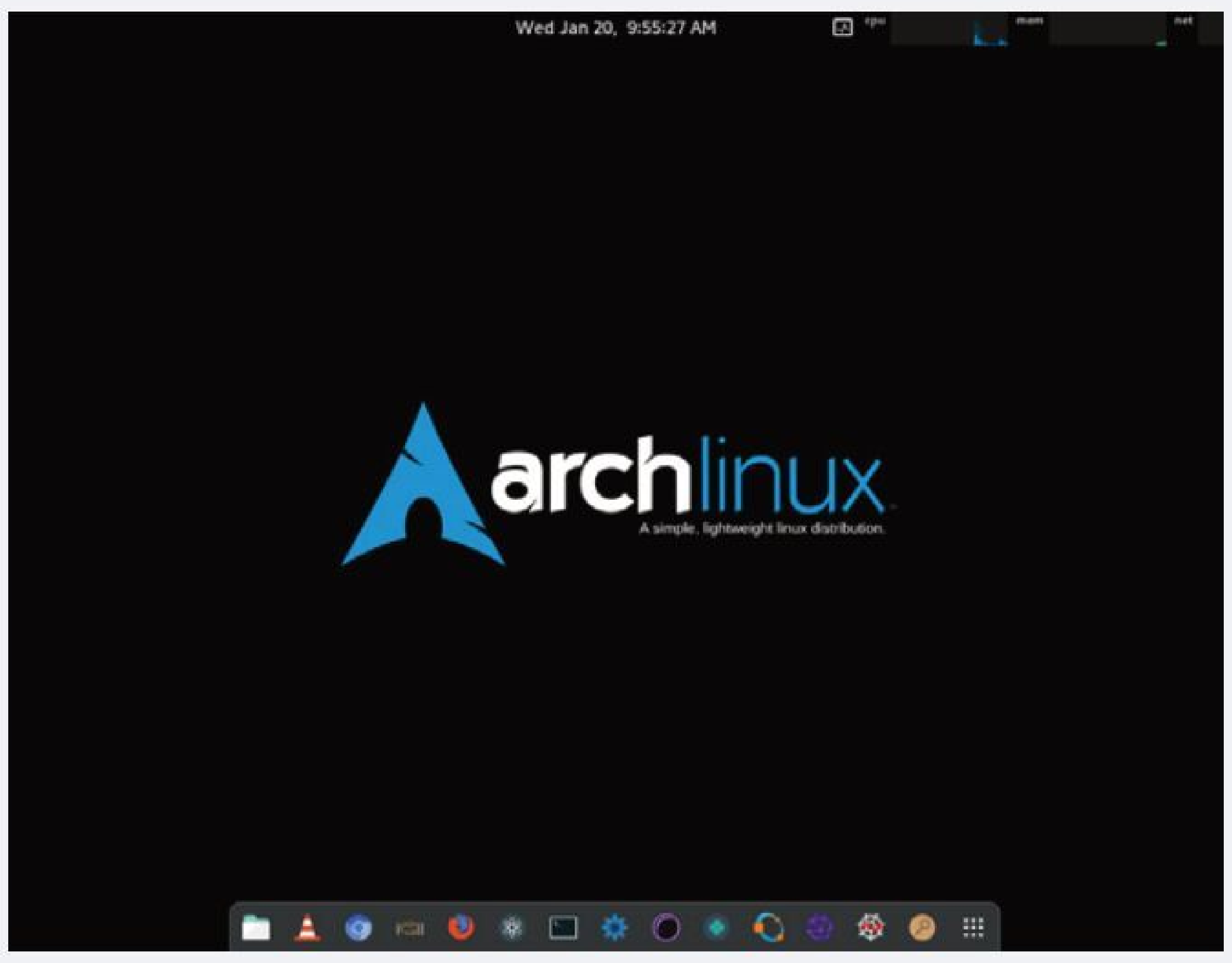
Ubuntu, for all its faults, is a good Linux distro to start experimenting with. It's a clean interface, easy to use and install and offers the user a complete Linux experience.

**www.ubuntu.com**

## ARCH

Arch is one of longest running Linux distributions and forms the basis of many other versions of Linux. Why install Mint or Ubuntu when you can install Arch? Many users do exactly that but it's not ideal for beginners. Ubuntu and Mint both offer an easier installation path and come with software packages to help you get started.

Arch on the other hand, is a more 'bare bones' affair. Arch is committed to free software and its repositories contain over 50,000 apps to install, including multiple different Desktop environments, and use as you would with any other distro.


Wed Jan 20, 9:55:27 AM
archlinux
A simple, lightweight linux distribution.

Arch is a distro for when you're more experienced with Linux. You start with nothing but the command line and from there you have to manually partition your hard drive, set where the installation files go, create a user, set the OS locale and finally install a desktop environment along with the apps you want.

The advantage though, for all this hard work, is a distro that you have created. This means your Arch distro won't come with all the unnecessary files and apps that others have preinstalled; it's custom made for you, by you.

**www.archlinux.org**

## RASPBERRY PI DESKTOP

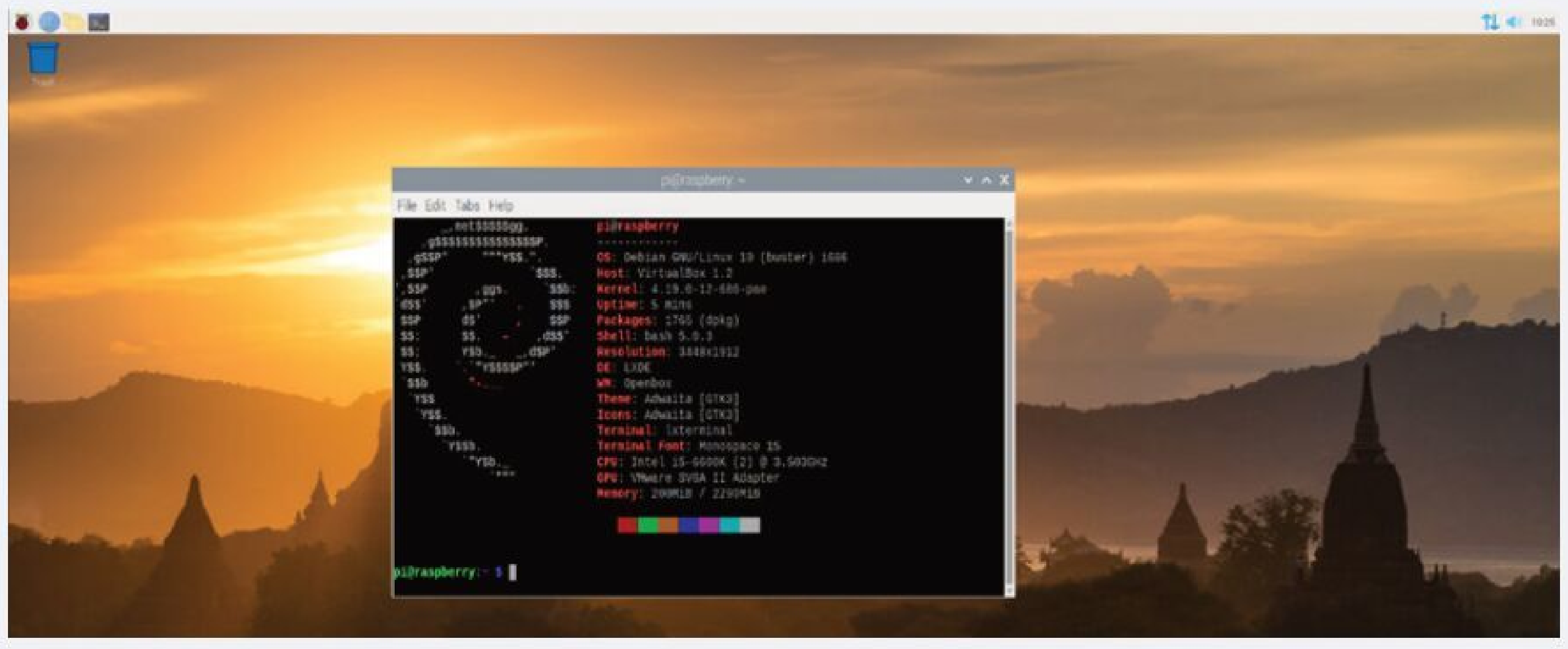
No doubt you've heard of the Raspberry Pi. It's hard not to have, as this remarkable, tiny computer has taken the technology world by storm for the last six years since it was introduced.

There are several aspects to the Raspberry Pi that make it such a sought after piece of the computing world. For one it's cheap, costing around £25 for what is essentially a fully working computer. It's small, measuring not much bigger than a credit card. You can build electronics with it, using a fully programmable interface; and it comes with Raspbian, its own custom-made, Debian-based operating system that includes an office suite alongside many different programming languages and educational resources.

Raspbian is exclusive to the Pi hardware, since the Raspberry Pi uses an ARM processor to power it. However, the Raspberry Pi Foundation has since released a PC version of Raspbian: Raspberry Pi Desktop.

Just like the Pi version, Raspberry Pi Desktop comes with the all the coding, educational and other apps you will ever need. It's quick, stable and works superbly. If you're interested in stretching your Linux experience, then this is certainly one of the top distros to consider.

**www.raspberrypi.org/downloads/raspberry-pi-desktop**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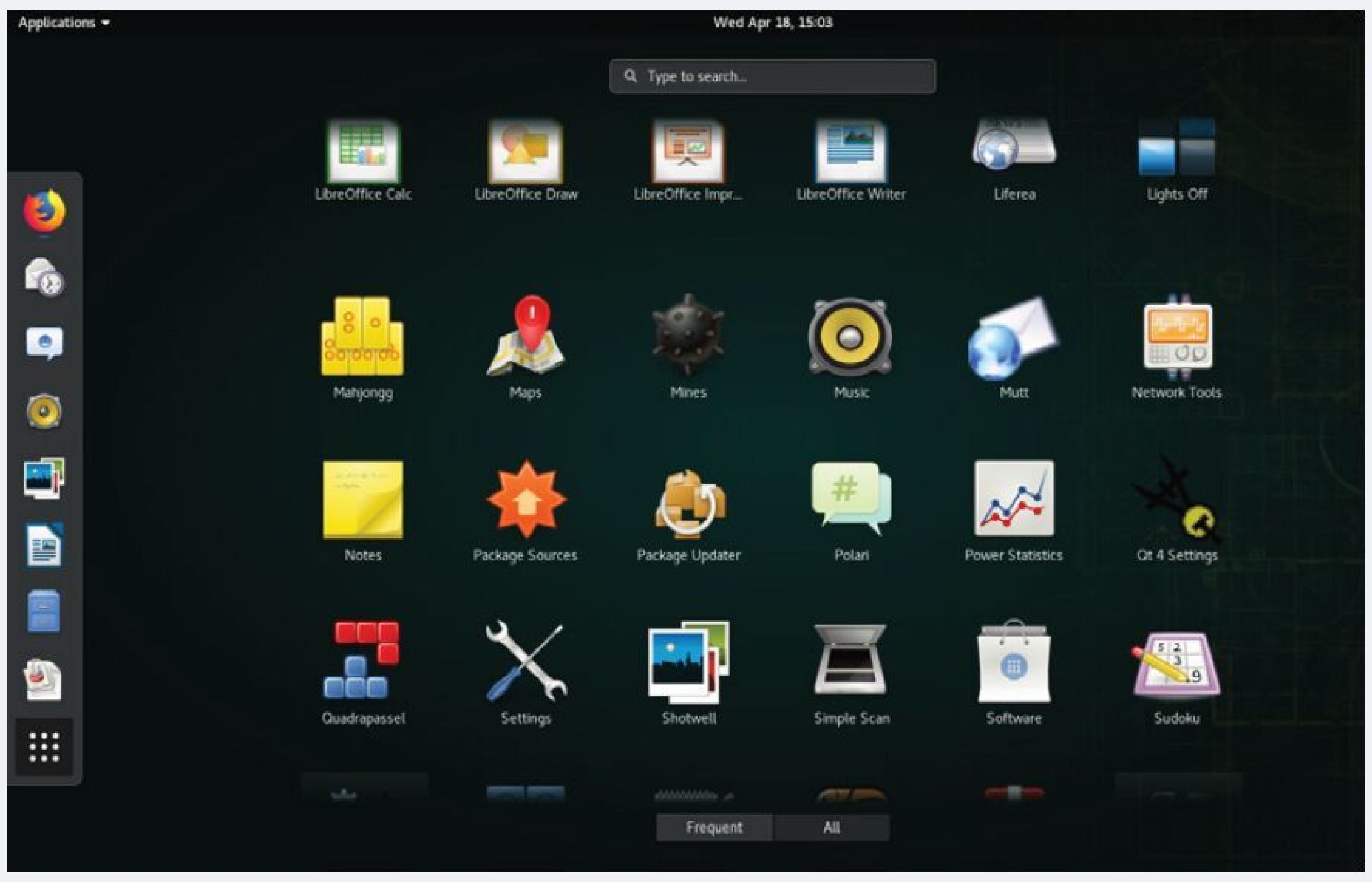
## OPENSUSE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Mines
Music
Mutt
Network Tools
Notes
Package Sources
Package Updater
Polari
Power Statistics
Qt 4 Settings
Quadrapassel
Settings
Shotwell
Simple Scan
Software
Sudoku
Frequent
All

Most Linux distributions fall into two camps. There are ones with the latest features and technology like Ubuntu and Mint and those with few new features but rock solid reliability, like Debian.

Meanwhile, openSUSE attempts to cover both bases. OpenSUSE Leap is the rock solid system. It's developed openly by a community along with SUSE employees, who develop an enterprise-level operating system, SUSE; this powers the London Stock Exchange amongst other things. It is designed for mission critical environments where 'there is no scope for instability'. If you find all that too sensible, openSUSE Tumbleweed is a rolling release with all the latest features, and the occasional crash.

openSUSE is a highly respected Linux distribution and many of its core contributors work on the Linux Kernel, LibreOffice, Gnome and other key Linux areas. In short, openSUSE is where you'll find the pros hanging out.

**www.openSUSE.org**

# Equipment You Will Need

The system requirements for successfully installing Linux Mint on to a PC are surprisingly low, so even a computer that's several years old will happily run this distro. However, it's worth checking you have everything in place before proceeding.

## MINTY INGREDIENTS

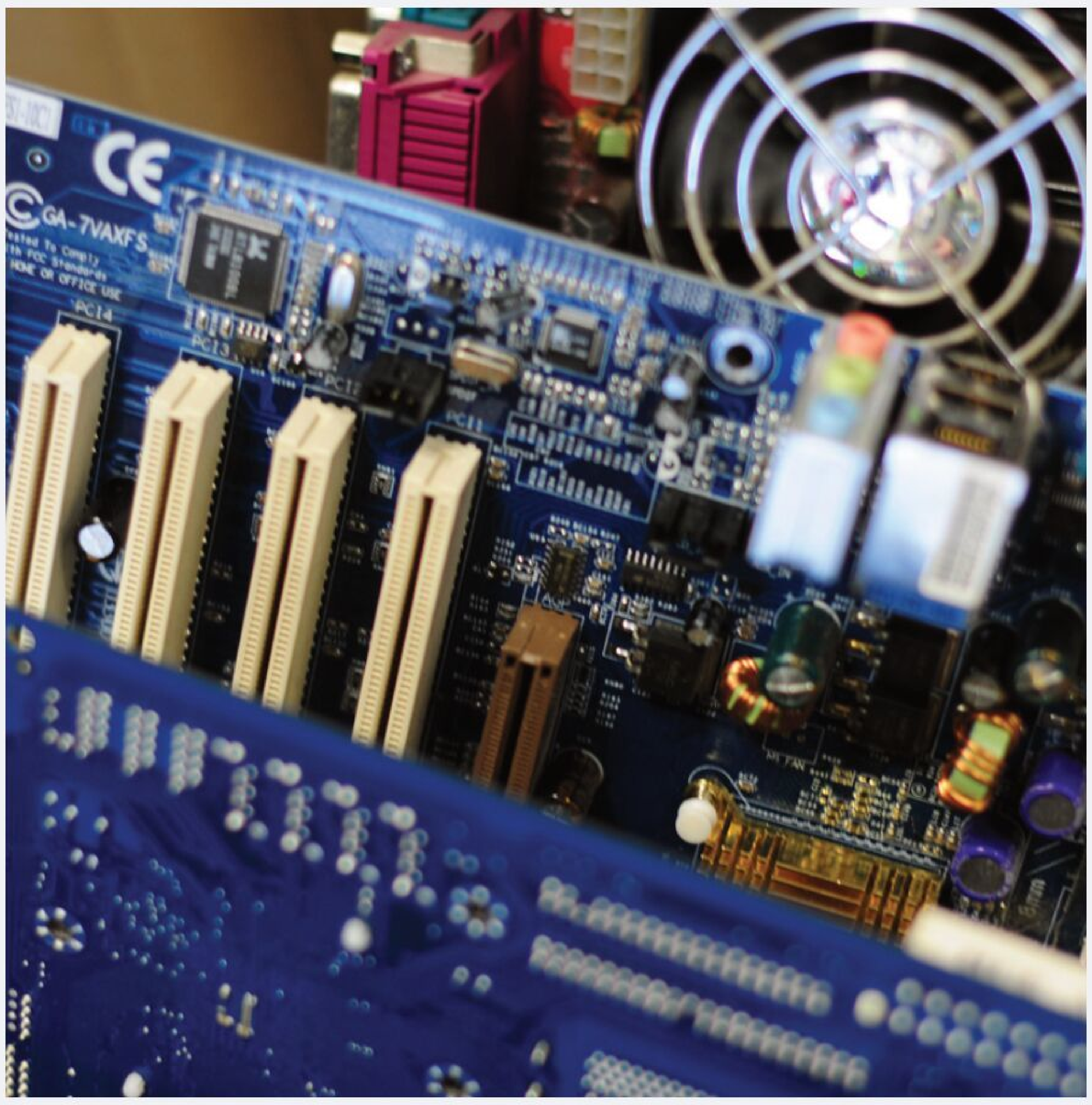
**Before we start working our way through this book, here's what you need to install and run Linux Mint. You have several choices available, so take your time and see which works best for you.**

### SYSTEM REQUIREMENTS

The minimum system requirements for Linux Mint are as follows:

**CPU** – 700MHz
**RAM/Memory** – 512MB
**Hard Drive space** – 9GB (20GB recommended)
**Display** – 1024 x 768 resolution

Obviously the better the system you have, the better the experience will be and quicker too.



### USB INSTALLATION

You can install Linux Mint onto your computer via USB or DVD. We look into each a little later on but if you're already familiar with the process, or thinking of USB and just gathering the hardware you need, then you're going to need a minimum 4GB USB flash drive to store the Linux Mint ISO.

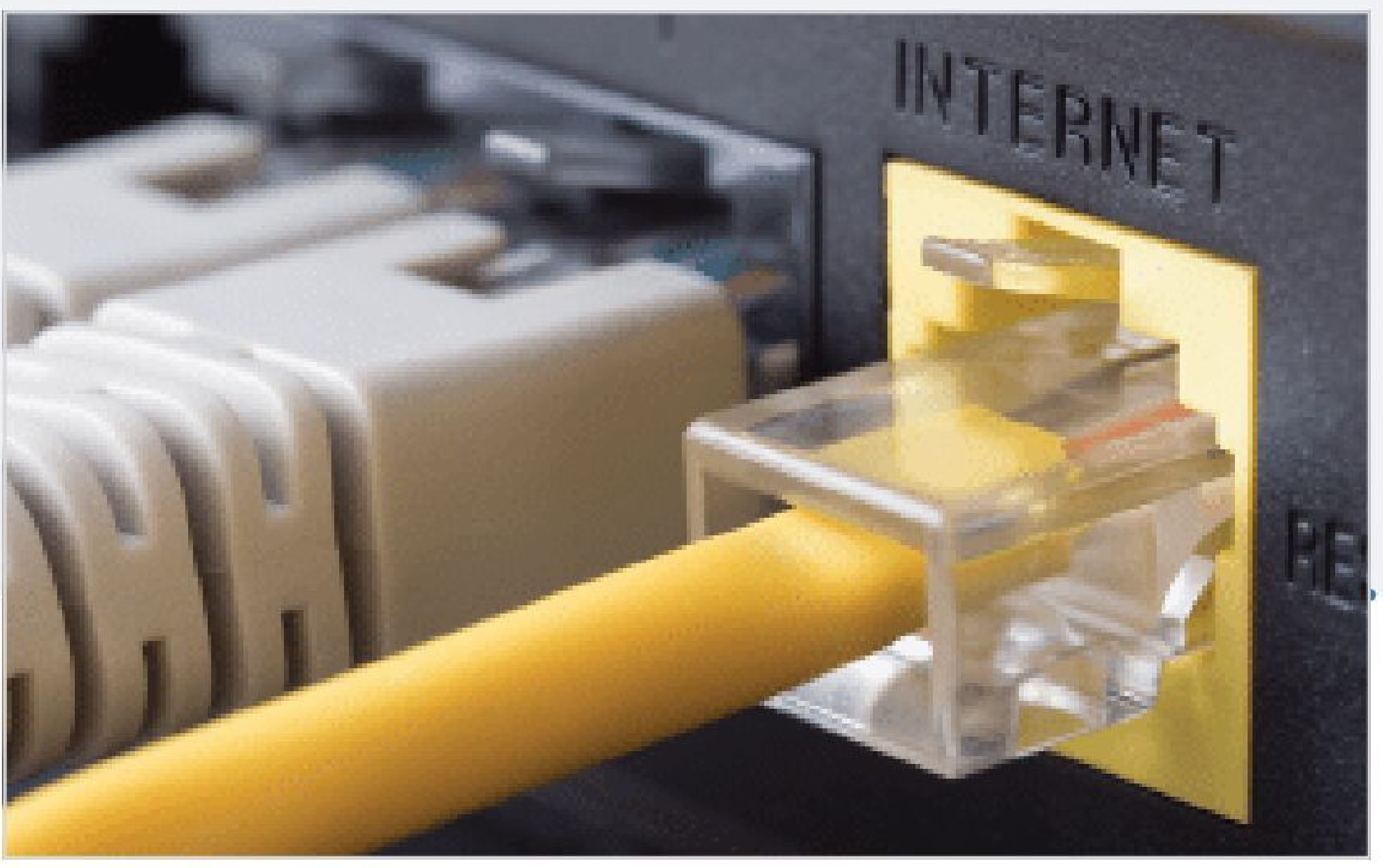
4GB
Transcend

### DVD INSTALLATION

DVD installation of Linux Mint simply requires a blank DVD-R disc. Of course, you also need an optical drive (a DVD Writer drive) before you're able to transfer or burn the ISO image to the disc.

## VIRTUAL ENVIRONMENT

Installation to a virtual environment is a favourite method of testing and using Linux distros. Linux Mint works exceedingly well when used in a virtual environment but more on that later. There are many different virtual environment apps available; however, VirtualBox, from Oracle, is one of the easiest to into. You can find the latest version at **www.virtualbox.org**.



## INTERNET CONNECTION

It goes without saying really, that an Internet connection is vital for making sure that Linux Mint is up to date with the latest updates and patches, as well as the installation of further software. Although you don't need an Internet connection to use Linux Mint, you'll miss out on a world of free software available for the distro.

## MAC HARDWARE

Although Linux Mint can be installed onto a Mac, there's a school of thought that recommends Mac owners use a virtual environment, such as Virtualbox or Parallels; and why not, macOS is already a splendid operating system. If you're wanting to breathe new life into an older Mac, make sure it's an Intel CPU model and not the Power PC models. Beware though, it's not as pain free as installing on to a PC.

# Desktop Environments

Linux Mint comes in several different versions, or flavours: Cinnamon, MATE and Xfce; there are 32-bit and 64-bit versions of these too. What does it all mean though and which version should you choose for your installation?

## WHICH MINT?

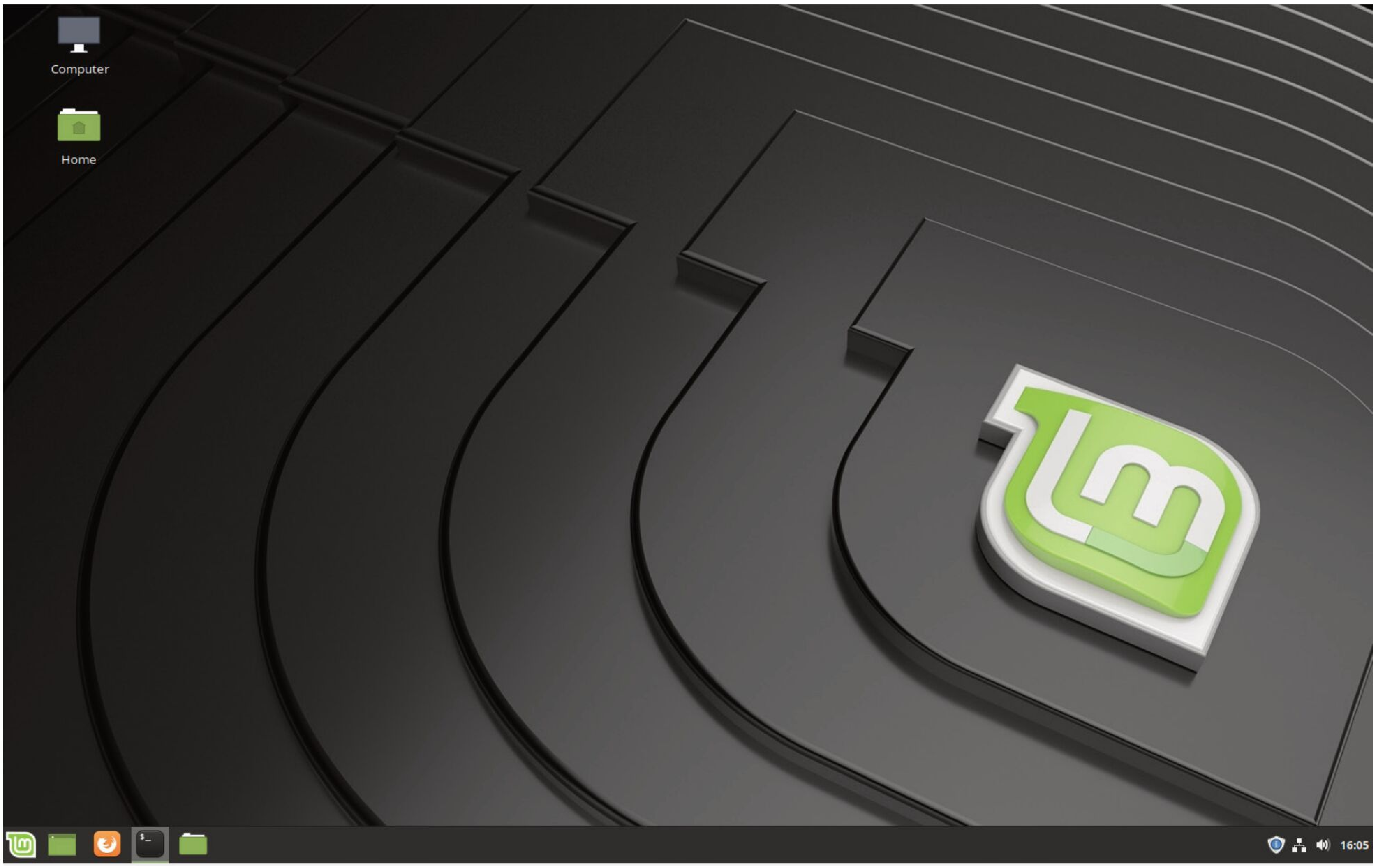
**A Desktop Environment is the graphical interface which you use to interact with the core Linux system. Just as the graphical desktop for Windows 10 is also called Fluent Design.**

Linux Mint offers the user a choice of versions of the distro: Cinnamon, MATE and Xfce. While that may sound a little confusing for the newcomer, essentially each of the versions available contains the same core Linux structure and kernel, the kernel is the core of the operating system, that handles all the instructions between the software and hardware.

Each version is simply a different desktop environment, the Graphical User Interface (GUI) that you use to interact with the operating system. Each of the desktop environments uses different apps to access or use the system, such as the file manager to browse the operating system's file structure or the way it launches other apps. Again though, the core available productivity, video and graphic suites are the same, and function in the same way.

Why bother then with a different desktop environment? Simply put, it's down to personal taste. Some users prefer MATE, as MATE is a fork of the classic GNOME 2 environment and is a little more menu-centric and performs well on older computers. Others prefer Cinnamon, which is a more modern environment that works better on recent hardware and features some cutting edge desktop code. Xfce, on the other hand, is a lightweight desktop environment that works well on older hardware due to its extremely low use of the available system resources.

In short, Cinnamon is the flagship desktop environment for Linux Mint. MATE is more compatible with a wider variety of hardware. Where Windows, for example, only offers one desktop environment to work in, Linux offers many. Linux Mint has therefore opted to bring the user a wealth of choice.



## A DASH OF CINNAMON

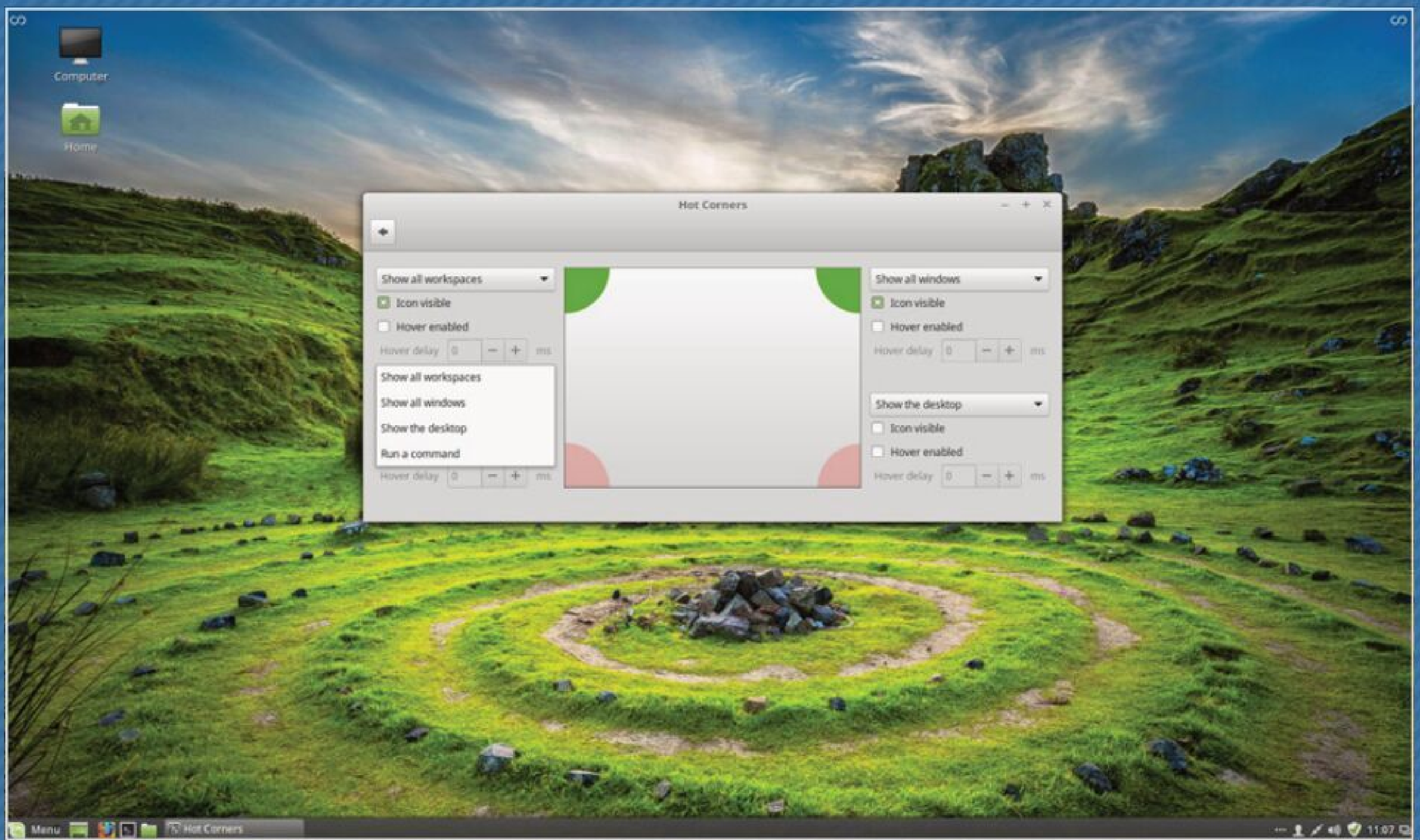
**Cinnamon has many benefits beyond its look and feel, although they are important factors. Here, we outline a couple of features to help you decide if it's the DE for you.**

### FAB FEATURE 1

It performs excellently on more modern systems but is a lot more stable than it used to be, and not quite the resource hog it once was. Therefore, don't be put off Cinnamon if you're using an older computer to install and test Linux Mint.

### FAB FEATURE 2

Cinnamon features configurable Hot Corners, where each corner of the desktop can be clicked to perform a certain task, such as display the Workspaces, Show all Windows or Run a Command. The Hot Corners are an excellent way to switch between different views and help make the desktop a more efficient environment.


Computer
Home
Hot Corners
Show all workspaces
Icon visible
Hover enabled
Hover delay
ms
Show all workspaces
Show all windows
Show the desktop
Run a command
Show all windows
Icon visible
Hover enabled
Hover delay
ms
Show the desktop
Icon visible
Hover enabled
Hover delay
ms
Menu
Hot Corners

## BEST MATE

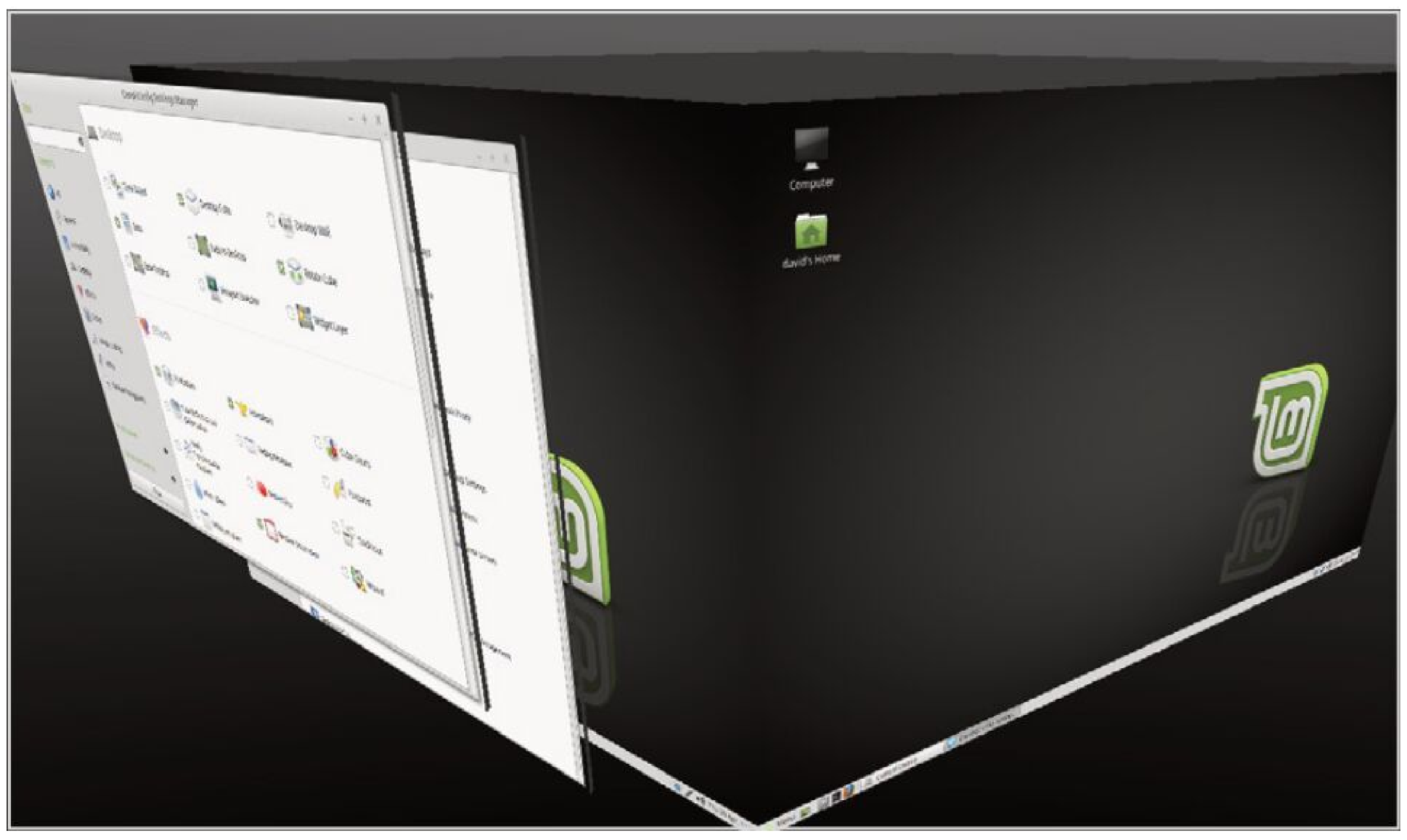
**MATE is a simple to use and intuitive DE that's fast and stable. In comparison to Cinnamon it looks a little antiquated but that's only on the surface. There's plenty to like with MATE.**

### FAB FEATURE 1

MATE is an excellent desktop environment for older computers. It works better with a larger number of hardware components that Cinnamon generally does but is also just as capable of delivering a great looking desktop as well as advanced customisations.

### FAB FEATURE 2

Due to its highly configurable nature, MATE can be customised to a fine degree. There are plenty of options available to the user who demands a little more from their desktop environment, including Compiz Settings, where you're able to configure all manner of desktop effects, even a 3D desktop cube.


Computer
David's Home

## CHOLESTEROL FREE DESKTOP

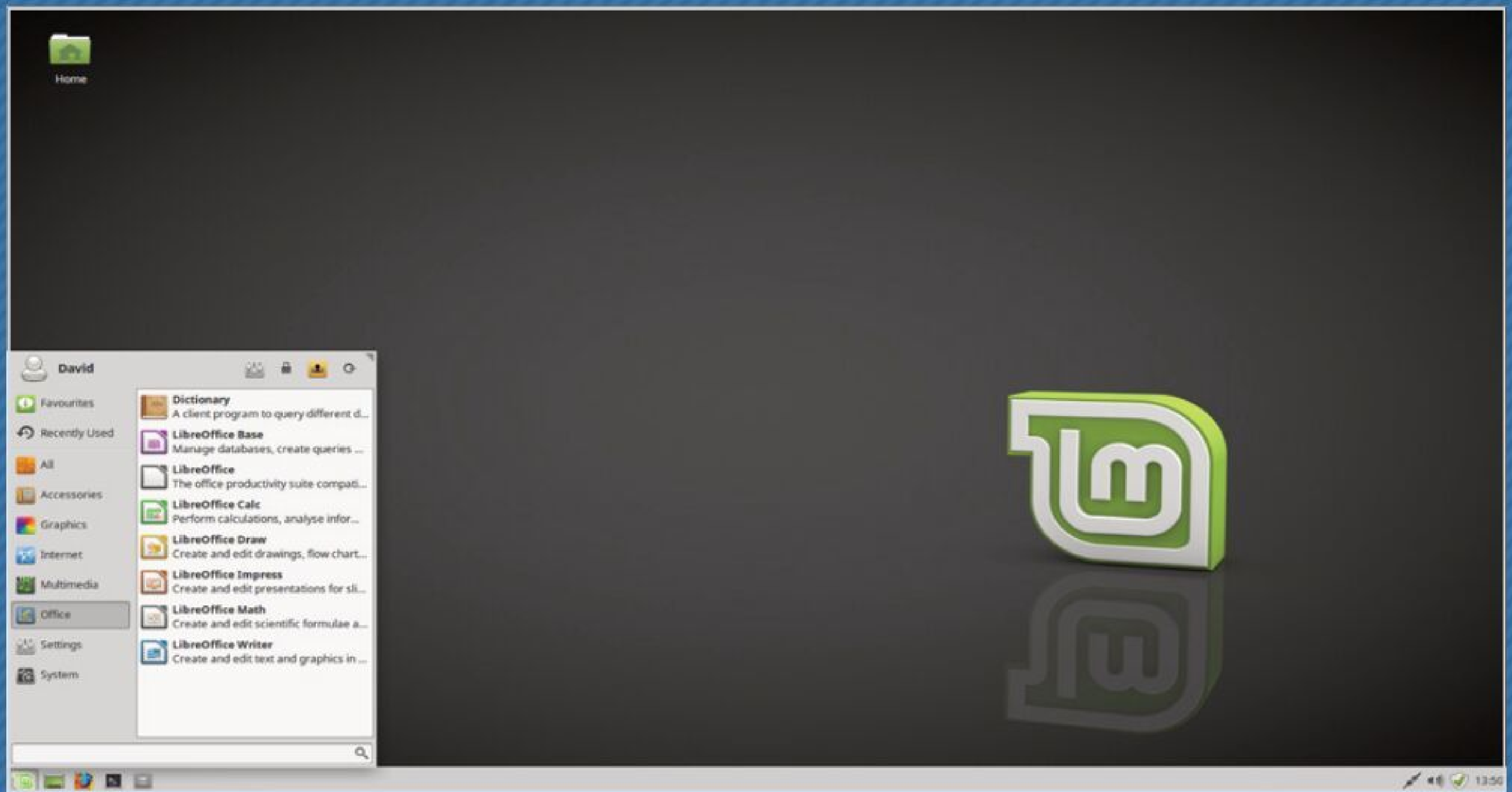
**Xfce started life as the Common Desktop Environment (CDE) in 1996. Since then it's changed name a few times and is now simply Xfce, with the nickname 'Cholesterol Free Desktop Environment'.**

### FAB FEATURE 1

Xfce really is a quick desktop and brings out the best in Linux as a fast operating system. In fact, it's taken us to this point from the top of the page to install it onto a new computer; a few hundred words written and we're using a brand new OS. Not bad.

### FAB FEATURE 2

Just because it's quick and lightweight doesn't mean Linux Mint Xfce isn't a complete desktop operating system. Just like the other environments on offer, you get the latest Firefox, Libreoffice, VLC, Gimp, chat apps and even a bit torrent client.


Home
David
Favourites
Recently Used
All
Accessories
Graphics
Internet
Multimedia
Office
Settings
System
Dictionary
A client program to query different d...
LibreOffice Base
Manage databases, create queries ...
LibreOffice
The office productivity suite compati...
LibreOffice Calc
Perform calculations, analyse infor...
LibreOffice Draw
Create and edit drawings, flow chart...
LibreOffice Impress
Create and edit presentations for sli...
LibreOffice Math
Create and edit scientific formulae a...
LibreOffice Writer
Create and edit text and graphics in ...

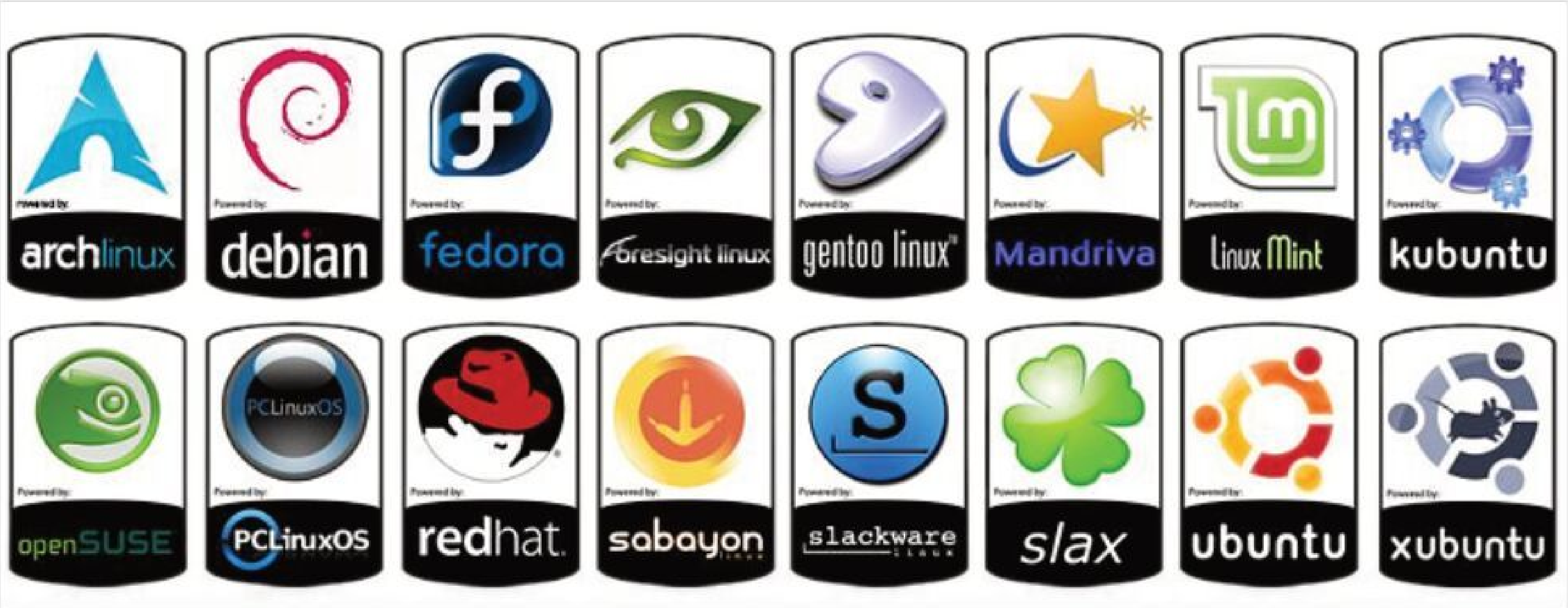
# Which Distro?

Up to now we've looked mainly at Linux Mint but there are other Linux distributions out there to try. In truth there are thousands of Linux distros available to download and install, so which one should you decide on to use?

## DISTRO HOPPING

Distro hopping is a term used by the community for people who never stick to a single distribution. Instead, they hop from one to the other and back again, testing each, using them, then moving on to another or a newly released distro.

There's nothing wrong with distro hopping, as it's a good way to get to grips with what's out there and discover the elements of one distro over another that may or may not appeal to your tastes. The problem of course is which one do you use overall?



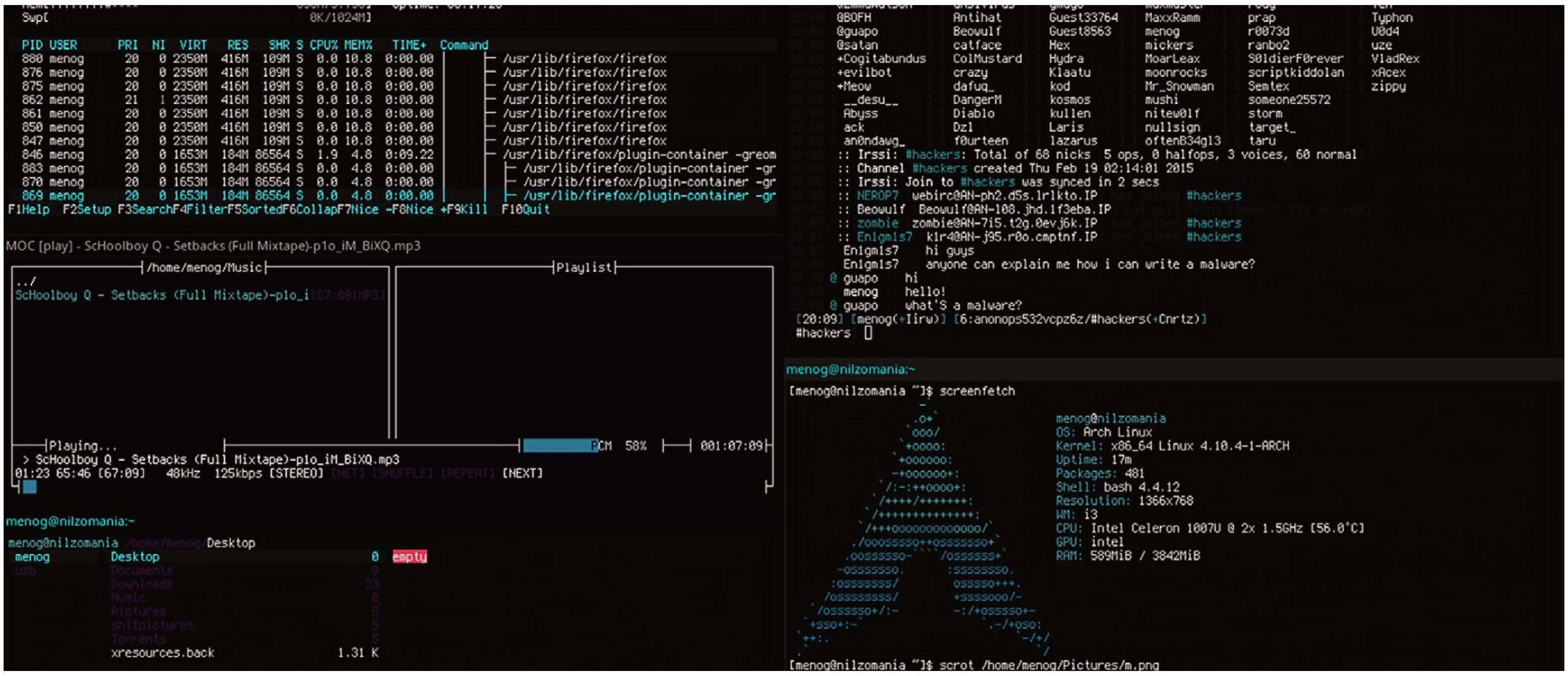
While distro hopping is a good thing, it's not exactly a stable way to enjoy Linux and get the most from it. We're not saying you should stick to one distro and never look elsewhere, as you would be missing a lot of great content out there, but instead we recommend you find a handful and slowly progress through them based on your increasing Linux skills.

For example, Linux Mint is an ideal starting place. It's an easy to install and use distro, has all the software you would normally use on a day-to-day basis already installed out-of-the-box and gently eases you into the unique world of Linux and how it works and performs.

Ubuntu offers much the same experience but it does this in a slightly different way. There's generally less preinstalled with Ubuntu than with Linux Mint, so you would need to manually install it yourself. Another point worth considering is the sheer volume of content and help pages dedicated to Ubuntu users when using Linux. If you get stuck, you're never too far from a solution to the problem.

Moving on, as you begin to grow more confident with Linux, you may test out the likes of openSUSE, Fedora or Debian. These are all excellent distros and each offers the user a slightly different perspective on how the system runs. Some are more demanding, in terms of Linux skills, than others, but essentially they each have some valuable lessons to learn for the user.

You may find yourself moving to a particular distro because it offers something radically different from the norm. Tails Linux, for example, is a distro that's designed purely for online anonymity. It contains complex and military grade encryption tools as well as tools and browsers designed to help you browse the web without ever being detected, traced or monitored. Kali Linux is designed for security professionals and contains many different kinds of ethical hacking



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  Swp[                                    0K/1024M]

  PID USER      PRI  NI  VIRT   RES   SHR S CPU% MEM%   TIME+  Command
  880 menog      20   0 2350M  416M  109M S  0.0 10.8  0:00.00 │     ├─ /usr/lib/firefox/firefox
  876 menog      20   0 2350M  416M  109M S  0.0 10.8  0:00.00 │     ├─ /usr/lib/firefox/firefox
  875 menog      20   0 2350M  416M  109M S  0.0 10.8  0:00.00 │     ├─ /usr/lib/firefox/firefox
  862 menog      21   1 2350M  416M  109M S  0.0 10.8  0:00.00 │     ├─ /usr/lib/firefox/firefox
  861 menog      20   0 2350M  416M  109M S  0.0 10.8  0:00.00 │     ├─ /usr/lib/firefox/firefox
  850 menog      20   0 2350M  416M  109M S  0.0 10.8  0:00.00 │     ├─ /usr/lib/firefox/firefox
  847 menog      20   0 2350M  416M  109M S  0.0 10.8  0:00.00 │     ├─ /usr/lib/firefox/firefox
  846 menog      20   0 1653M  184M 86564 S  1.9  4.8  0:09.22 │     ├─ /usr/lib/firefox/plugin-container -greom
  883 menog      20   0 1653M  184M 86564 S  0.0  4.8  0:00.00 │     │  ├─ /usr/lib/firefox/plugin-container -gr
  870 menog      20   0 1653M  184M 86564 S  0.0  4.8  0:00.00 │     │  ├─ /usr/lib/firefox/plugin-container -gr
  869 menog      20   0 1653M  184M 86564 S  0.0  4.8  0:00.00 │     │  ├─ /usr/lib/firefox/plugin-container -gr
F1Help  F2Setup F3SearchF4FilterF5SortedF6CollapF7Nice -F8Nice +F9Kill  F10Quit
```

```
MOC [play] - ScHoolboy Q - Setbacks (Full Mixtape)-p1o_iM_BiXQ.mp3
┌───────────┤/home/menog/Music├───────────┐┌──────────────┤Playlist├──────────────┐
│../                                      ││                                      │
│ScHoolboy Q - Setbacks (Full Mixtape)-p1o_i[67:09|MP3]                           │
├─┤Playing...├──────────┤                          ├──────┤PCM  58% ├──┤001:07:09├
 > ScHoolboy Q - Setbacks (Full Mixtape)-p1o_iM_BiXQ.mp3
01:23 65:46 [67:09]   48kHz  125kbps [STEREO] [NET] [SHUFFLE] [REPEAT] [NEXT]
```

```
menog@nilzomania:~
menog@nilzomania /home/menog/Desktop
 menog       Desktop                      0  empty
 usb         Documents                    9
             Downloads                   23
             Music                        0
             Pictures                     5
             shitpictures                 5
             Torrents                     5
             xresources.back          1.31 K
```

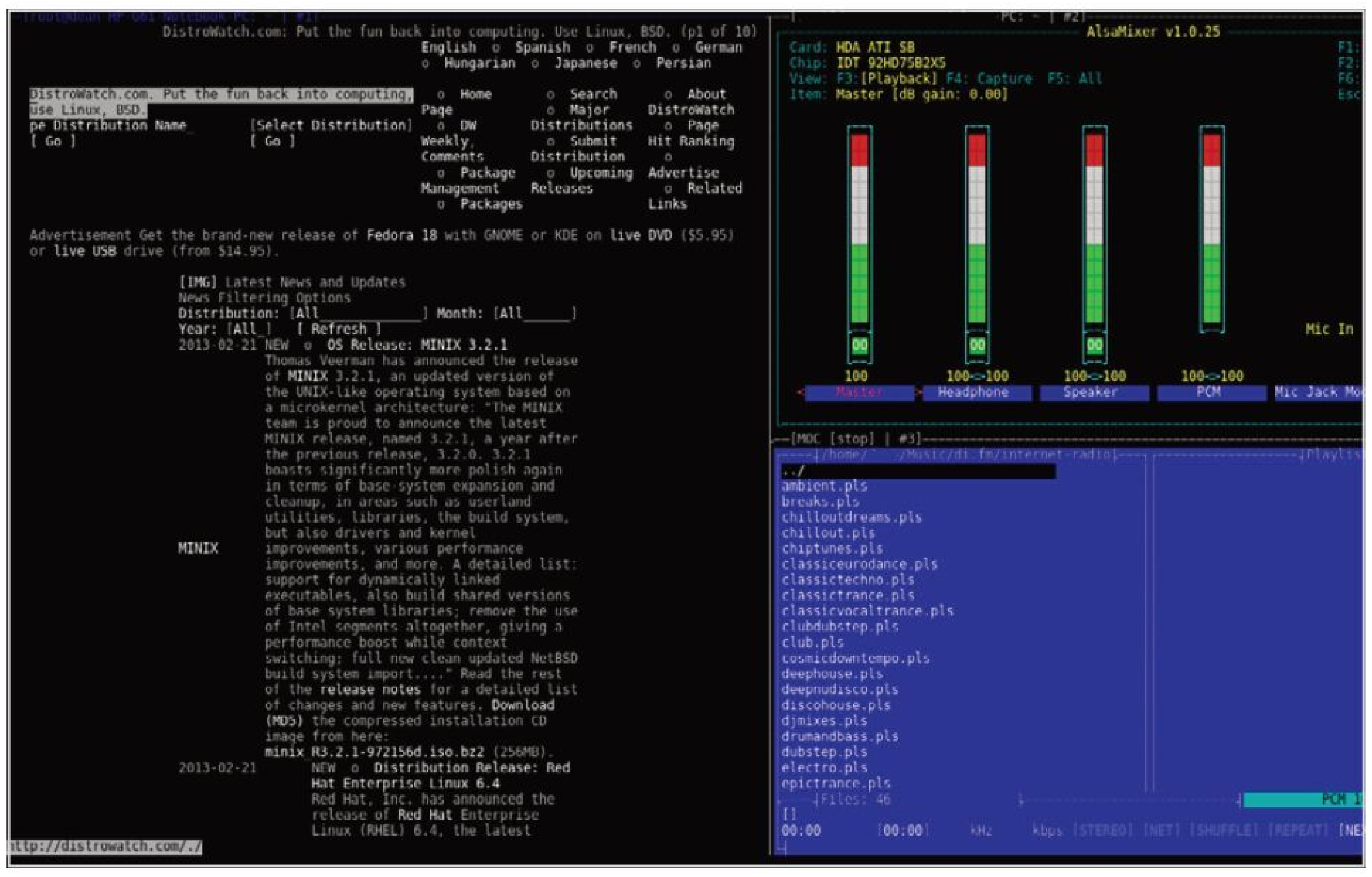
```
   @BOFH          Antihat        Guest33764    MaxxRamm      prap              Typhon
   @guapo         Beowulf        Guest8563     menog         r0073d            U0d4
   @satan         catface        Hex           mickers       ranbo2            uze
   +Cogitabundus  ColMustard     Hydra         MoarLeax      S0ldierF0rever    VladRex
   +evilbot       crazy          Klaatu        moonrocks     scriptkiddolan    xAcex
   +Meow          dafuq_         kod           Mr_Snowman    Semtex            zippy
    __desu__      DangerM        kosmos        mushi         someone25572
    Abyss         Diablo         kullen        nitew0lf      storm
    ack           Dzl            Laris         nullsign      target_
    an0ndawg_     f0urteen       lazarus       oftenB34g13   taru
   :: Irssi: #hackers: Total of 68 nicks  5 ops, 0 halfops, 3 voices, 60 normal
   :: Channel #hackers created Thu Feb 19 02:14:01 2015
   :: Irssi: Join to #hackers was synced in 2 secs
   :: NEROP7  webirc@AN-ph2.d5s.lrlkto.IP has joined #hackers
   :: Beowulf  Beowulf@AN-108.jhd.1f3eba.IP has quit [Ping timeout: 121 seconds]
   :: zombie  zombie@AN-7i5.t2g.0evj6k.IP has joined #hackers
   :: En1gm1s7  k1r4@AN-j95.r0o.cmptnf.IP has joined #hackers
    En1gm1s7    hi guys
    En1gm1s7    anyone can explain me how i can write a malware?
  @ guapo    hi
    menog    hello!
  @ guapo    what'S a malware?
[20:09] [menog(+Iirw)] [6:anonops532vcpz6z/#hackers(+Cnrtz)]
#hackers  []
```

```
menog@nilzomania:~
[menog@nilzomania ~]$ screenfetch
                   -`
                  .o+`                   menog@nilzomania
                 `ooo/                   OS: Arch Linux
                `+oooo:                  Kernel: x86_64 Linux 4.10.4-1-ARCH
               `+oooooo:                 Uptime: 17m
               -+oooooo+:                Packages: 481
             `/:-:++oooo+:               Shell: bash 4.4.12
            `/++++/+++++++:              Resolution: 1366x768
           `/++++++++++++++:             WM: i3
          `/+++ooooooooooooo/`           CPU: Intel Celeron 1007U @ 2x 1.5GHz [56.0°C]
         ./ooosssso++osssssso+`          GPU: intel
        .oossssso-````/ossssss+`         RAM: 589MiB / 3842MiB
       -osssssso.      :ssssssso.
      :osssssss/        osssso+++.
     /ossssssss/        +ssssooo/-
   `/ossssso+/:-        -:/+osssso+-
  `+sso+:-`                 `.-/+oso:
 `++:.                           `-/+/
 .`                                 `/
[menog@nilzomania ~]$ scrot /home/menog/Pictures/m.png
```

tools preinstalled, that a user can run for penetration testing against their network. There was once even a Hannah Montana Linux distribution but the less we talk about that the better. The point being, there's a distro out there for you.

Needless to say, once you've mastered Linux to a relatively high degree, probably a power user ability, then you will want to expand your skills and begin to build your own Linux distro based on Arch, Debian or one of the many other distros available. Doing so involves a lot of command line knowledge, as well as knowledge on how the Linux system works and interacts with the hardware in the computer. You will need to partition your own hard drive, install a desktop environment and eventually install the apps and programs you want. Doing so takes time and again there are a lot of skills you're going to need to learn.

Eventually you can consider yourself a technical Linux user but never consider yourself an expert, after all we're always learning something new. You can build your own distro from scratch, help other Linux users out with problems, maybe even contribute to the improvement of a distro during its testing phase or build. Where next then?



```
                    DistroWatch.com: Put the fun back into computing. Use Linux, BSD. (p1 of 10)
                                                English  o  Spanish  o  French  o  German
                                                o  Hungarian  o  Japanese  o  Persian

DistroWatch.com. Put the fun back into computing.   o  Home       o  Search      o  About
Use Linux, BSD.                                     Page          o  Major      DistroWatch
pe Distribution Name        [Select Distribution]   o  DW       Distributions    o  Page
[ Go ]                      [ Go ]                 Weekly,        o  Submit    Hit Ranking
                                                   Comments     Distribution     o
                                                     o  Package    o  Upcoming   Advertise
                                                   Management   Releases         o  Related
                                                     o  Packages                 Links

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or live USB drive (from $14.95).

                    [IMG] Latest News and Updates
                    News Filtering Options
                    Distribution: [All____________] Month: [All_____]
                    Year: [All_]   [ Refresh ]
                    2013-02-21 NEW  o  OS Release: MINIX 3.2.1
                              Thomas Veerman has announced the release
                              of MINIX 3.2.1, an updated version of
                              the UNIX-like operating system based on
                              a microkernel architecture: "The MINIX
                              team is proud to announce the latest
                              MINIX release, named 3.2.1, a year after
                              the previous release, 3.2.0. 3.2.1
                              boasts significantly more polish again
                              in terms of base-system expansion and
                              cleanup, in areas such as userland
                              utilities, libraries, the build system,
                              but also drivers and kernel
                    MINIX     improvements, various performance
                              improvements, and more. A detailed list:
                              support for dynamically linked
                              executables, also build shared versions
                              of base system libraries; remove the use
                              of Intel segments altogether, giving a
                              performance boost while context
                              switching; full new clean updated NetBSD
                              build system import...." Read the rest
                              of the release notes for a detailed list
                              of changes and new features. Download
                              (MD5) the compressed installation CD
                              image from here:
                              minix_R3.2.1-972156d.iso.bz2 (256MB).
                    2013-02-21     NEW  o  Distribution Release: Red
                                   Hat Enterprise Linux 6.4
                                   Red Hat, Inc. has announced the
                                   release of Red Hat Enterprise
                                   Linux (RHEL) 6.4, the latest
ttp://distrowatch.com/./
```

```
                              AlsaMixer v1.0.25
Card: HDA ATI SB                                                  F1:
Chip: IDT 92HD75B2X5                                              F2:
View: F3:[Playback] F4: Capture  F5: All                          F6:
Item: Master [dB gain: 0.00]                                      Esc

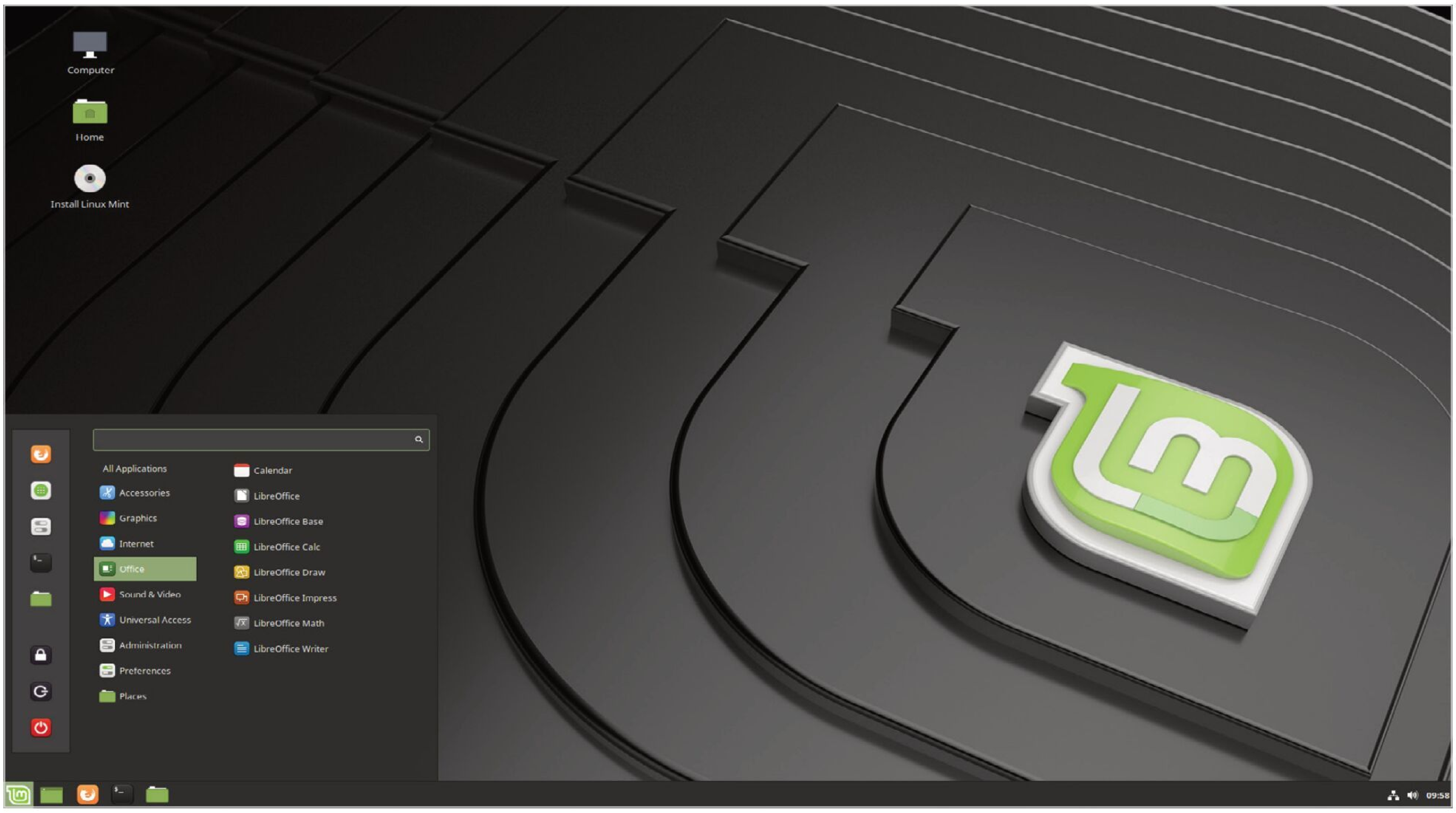
                                                             Mic In
   00          00          00
  100       100<>100    100<>100    100<>100
 <Master>   Headphone    Speaker      PCM       Mic Jack Mo

─[MOC [stop] | #3]──────────────────────────────────────────
────┤/home/`   /Music/di.fm/internet-radio├─── ──────────────┤Playlis
../
ambient.pls
breaks.pls
chilloutdreams.pls
chillout.pls
chiptunes.pls
classiceurodance.pls
classictechno.pls
classictrance.pls
classicvocaltrance.pls
clubdubstep.pls
club.pls
cosmicdowntempo.pls
deephouse.pls
deepnudisco.pls
discohouse.pls
djmixes.pls
drumandbass.pls
dubstep.pls
electro.pls
epictrance.pls
─────┤Files: 46                ┤                      ┤         PCM 1
[]
00:00         [00:00]      kHz      kbps [STEREO] [NET] [SHUFFLE] [REPEAT] [NE
```

Oddly enough, most higher-end technical users find themselves back at square one, using a distro like Linux Mint. The main reason is usually because it's an easy option, and it's a stable environment. Just because you know the system inside and out, doesn't mean you always want to be fixing potential issues. Most of us would prefer the easy life, especially where technology is concerned, so the logical choice would be to choose a distro that's simple, yet still powerful enough to do everything you want it to do, hence Linux Mint.

However, in the end, it's purely down to choice, your own personal choice. You may find that after going through the tutorials in this title you don't like Linux Mint or the Cinnamon desktop. Fine, you may prefer Ubuntu, Debian or openSUSE: that's the beauty of Linux. The freedom to change what you want, to distro hop from one to another without being penalised by cost or lack of access.

The answer to the question, which distro is: any which one you like! It can be as complex or easy as you need it to be, as long as it does what you want it to do, then it's perfect.



"In real open source, you have the right to control your own destiny."

*– Linus Torvalds (developer of the Linux kernel)*

# Getting Started with Linux

It's all fine and well talking about how good Linux is but how do you get it on your computer? Installing Linux is remarkably simple but there are several options available to you. This section looks into how you can download the Linux ISO, install it on a PC as your main operating system and even how to install a virtual environment.

With a virtual environment you can run Linux while still using your main operating system, be that Windows or macOS. Intrigued? Read on and find out more.

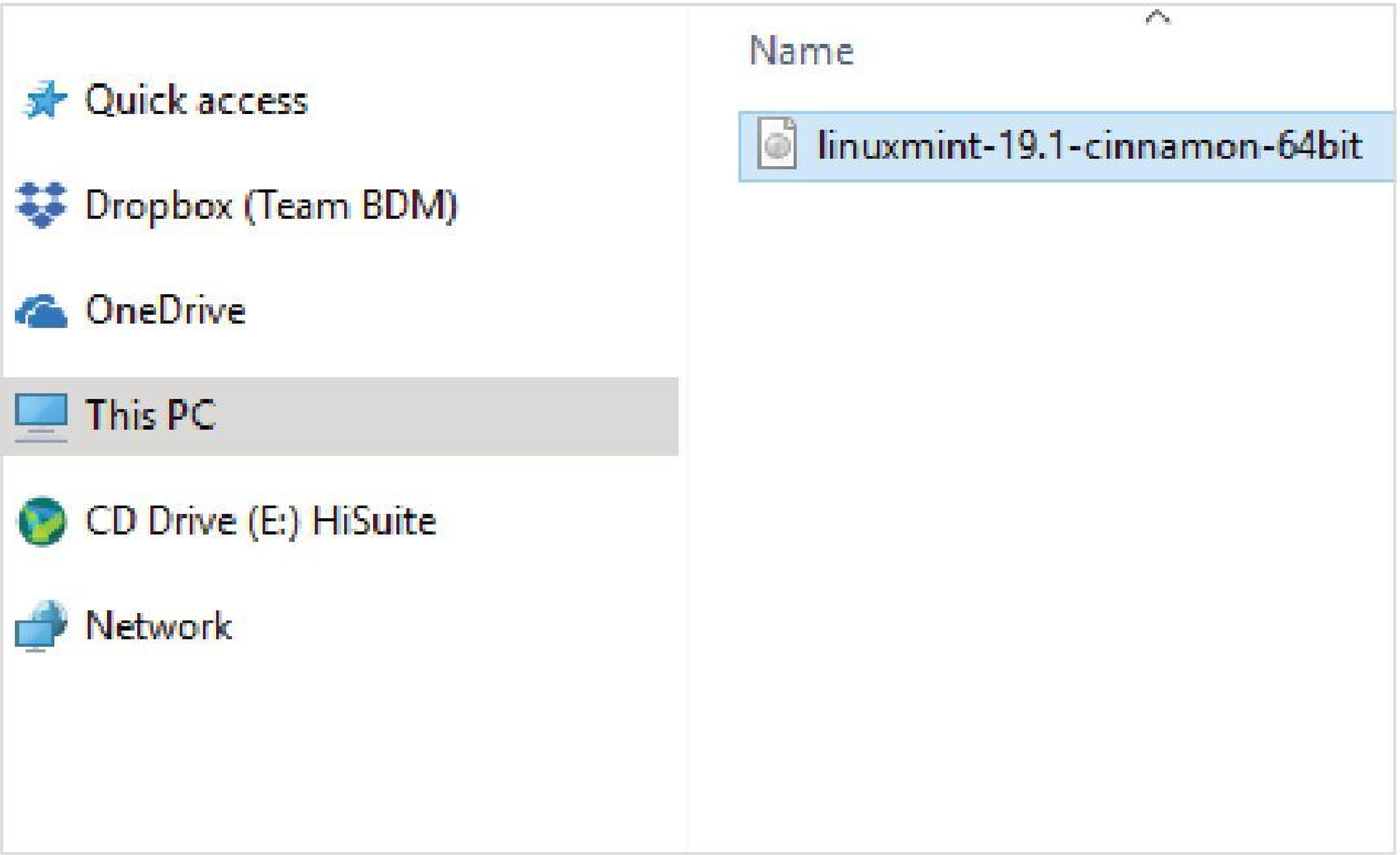
# Creating a Linux Installer on Windows

You need to transfer the downloaded Linux ISO to either a DVD or a USB key before being able to install it onto a computer. This will be a live environment, which allows you to test the OS prior to installation, but first you need to create the bootable media.

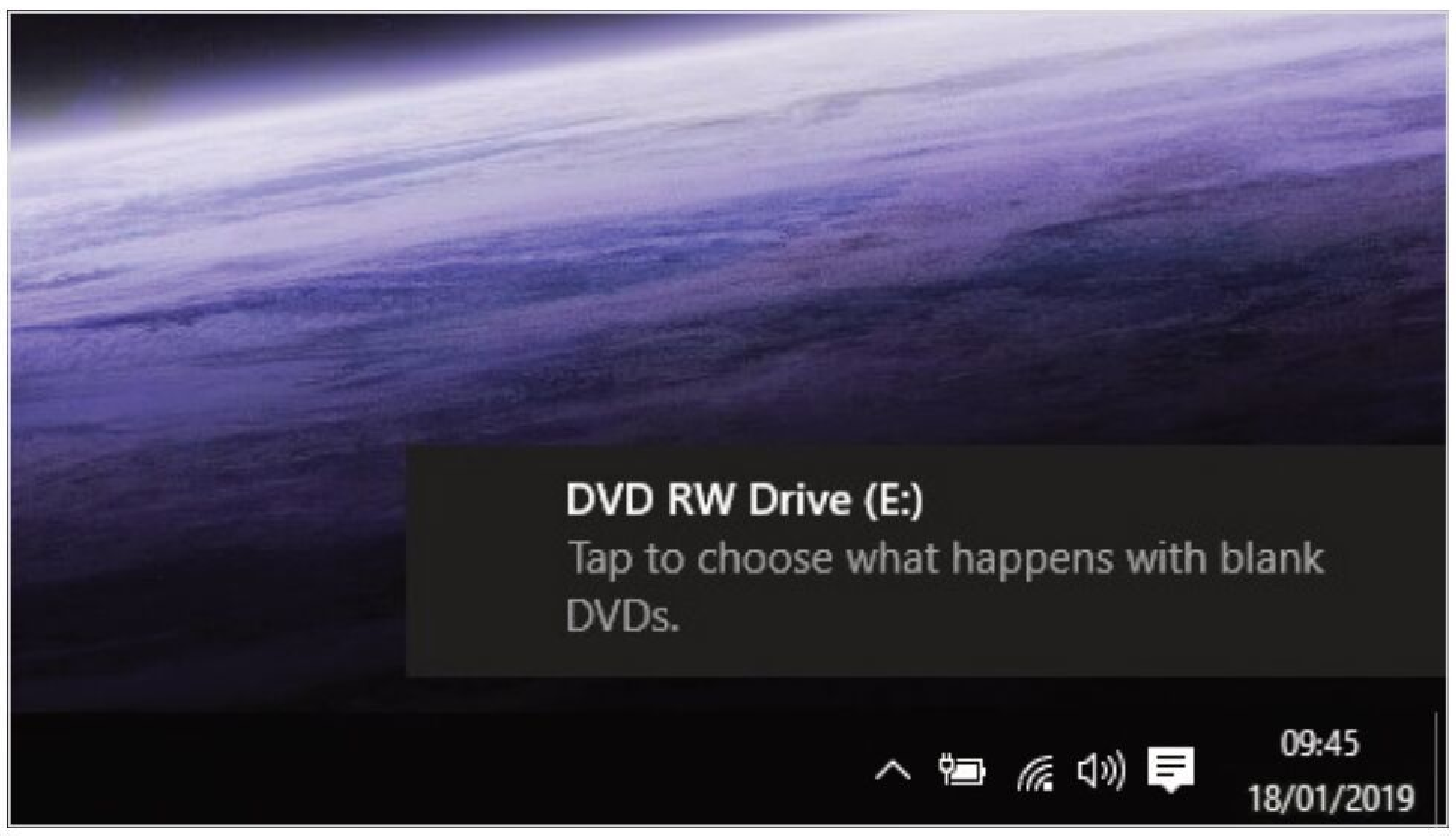
## DVD BOOTABLE MEDIA

**We're using a Windows 10 PC here to transfer the ISO to a DVD. If you're using a version of Windows from 7 onward the process is extremely easy.**

**STEP 1** First locate the ISO image of Linux you've already downloaded. You can usually find it in the Downloads folder in Windows 7, 8.1 and 10 computers, unless you specified a different location when saving it.


Quick access
Dropbox (Team BDM)
OneDrive
This PC
CD Drive (E:) HiSuite
Network
Name
linuxmint-19.1-cinnamon-64bit

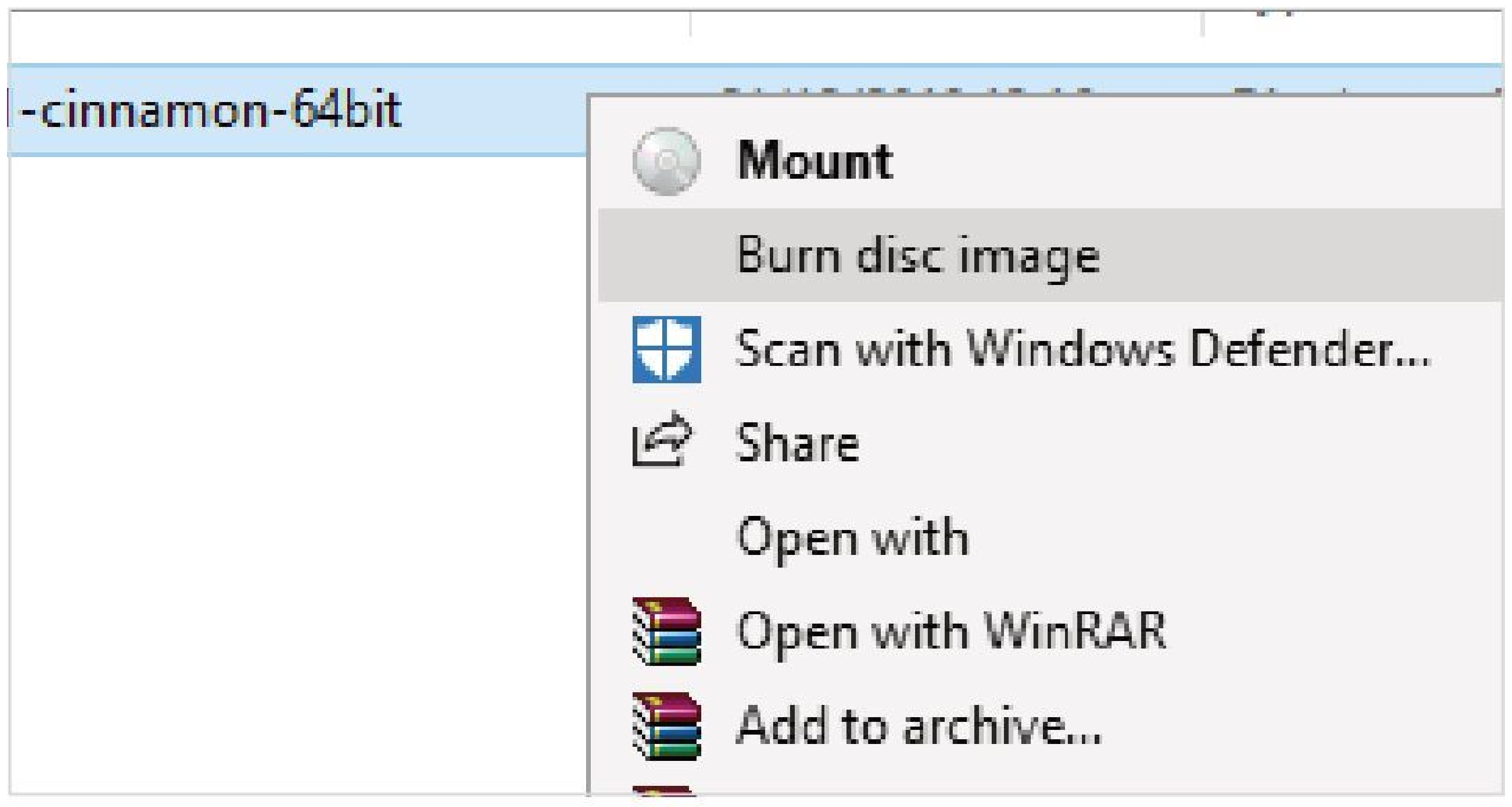
**STEP 2** Next insert a recordable DVD disc into your computer's optical drive. After a few seconds, while the disc is read, Windows displays a pop-up message asking you what to do with the newly inserted disc. Ignore this, as we're going to use the built-in image burning function.



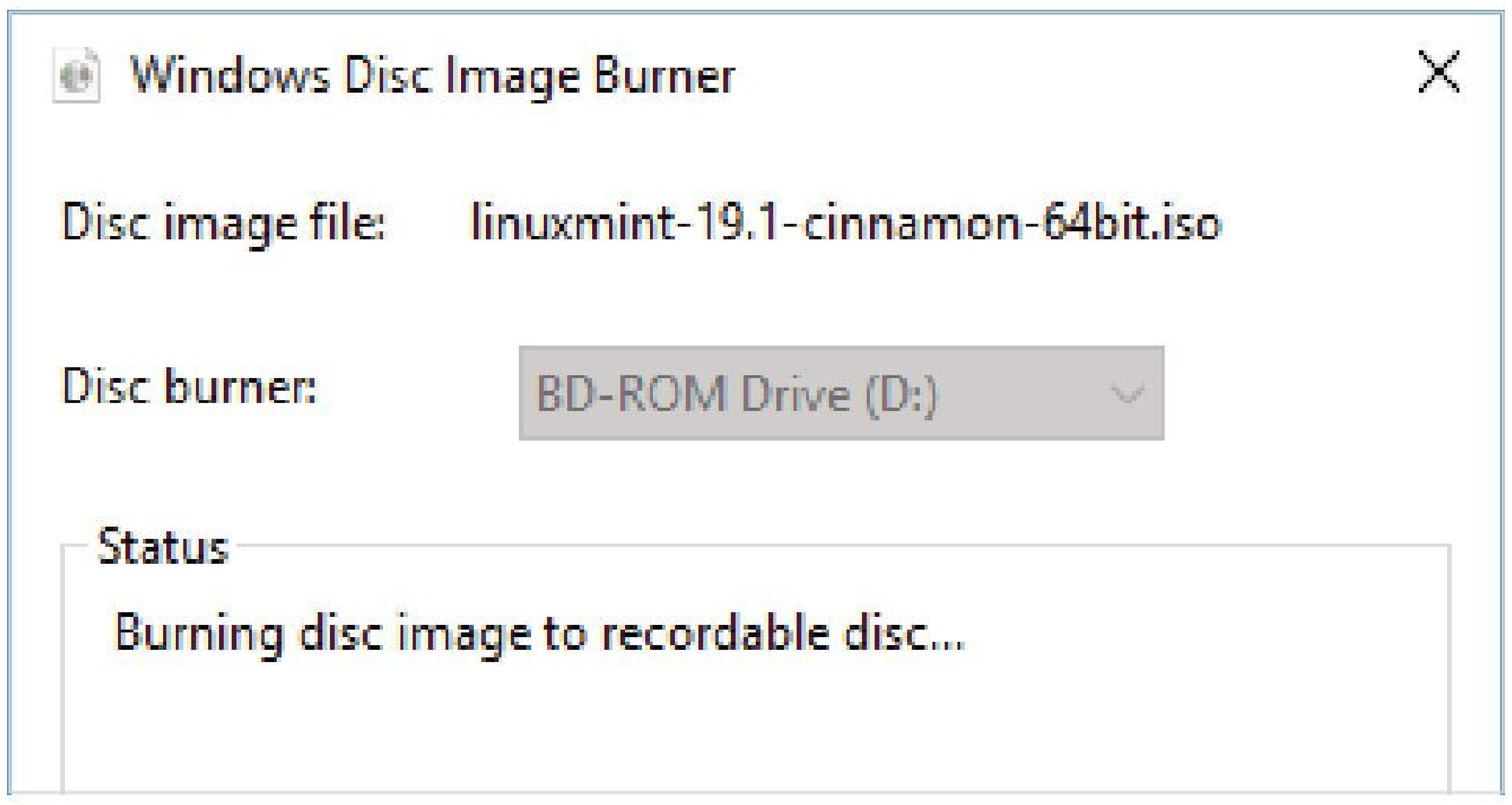
DVD RW Drive (E:)
Tap to choose what happens with blank DVDs.

09:45
18/01/2019

**STEP 3** Right-click the Linux ISO and from the menu select Burn Disc Image. Depending on the speed of the PC, it may take a few seconds before anything happens. Don't worry too much, unless it takes more than a minute, in which case it might be worth restarting your PC and trying again. With luck, the Windows Disc Image Burner should launch.


-cinnamon-64bit
Mount
Burn disc image
Scan with Windows Defender...
Share
Open with
Open with WinRAR
Add to archive...

**STEP 4** With the Windows Disc Image Burner dialogue box open, click on the 'Verify disc after burning' tick box, then the Burn button. The process should take a few minutes, depending on the speed of your PC's optical drive. Once it's complete it runs through the verification stage and when done the optical drive should auto-eject the disc for you.



Windows Disc Image Burner

Disc image file: linuxmint-19.1-cinnamon-64bit.iso

Disc burner: BD-ROM Drive (D:)

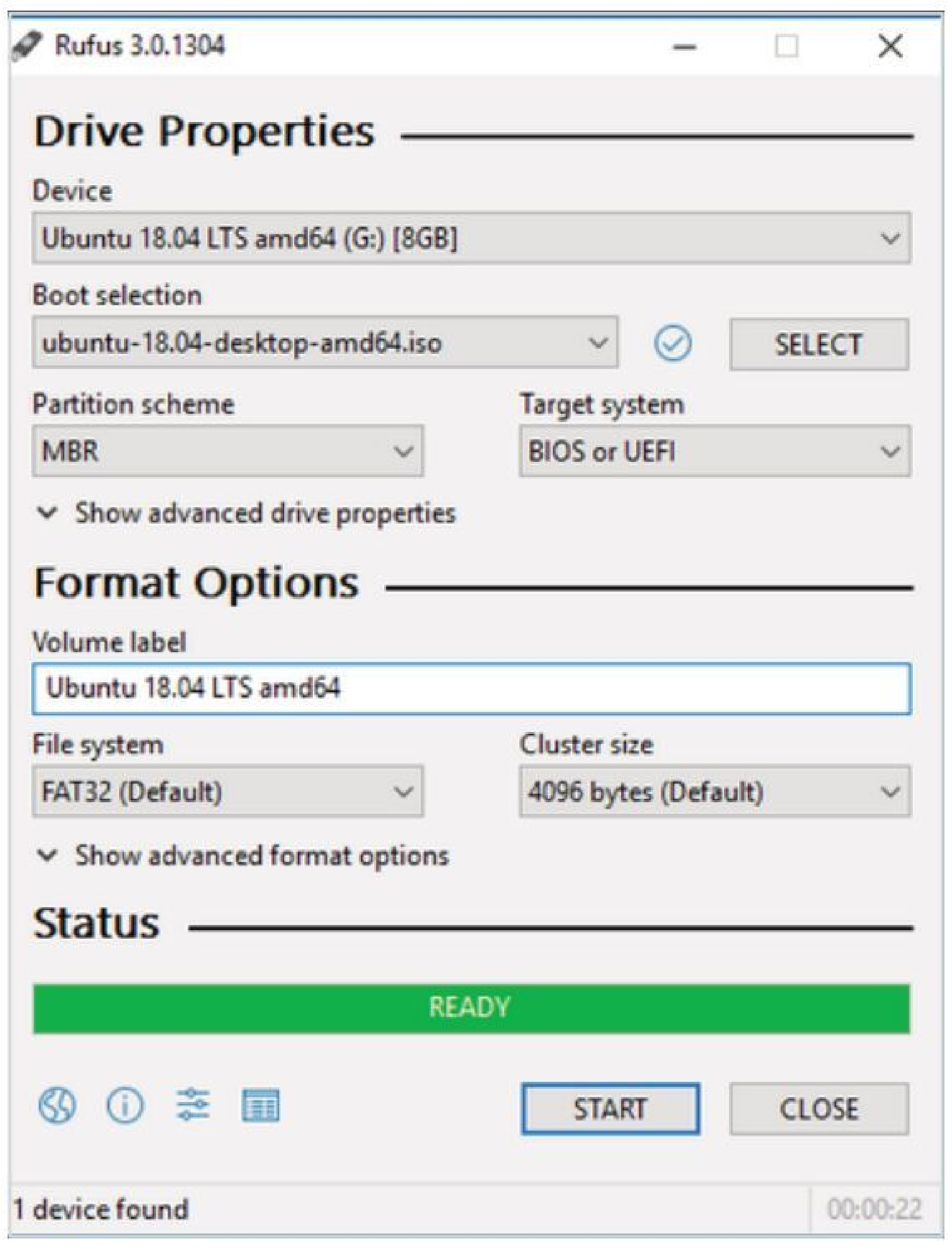
Status

Burning disc image to recordable disc...

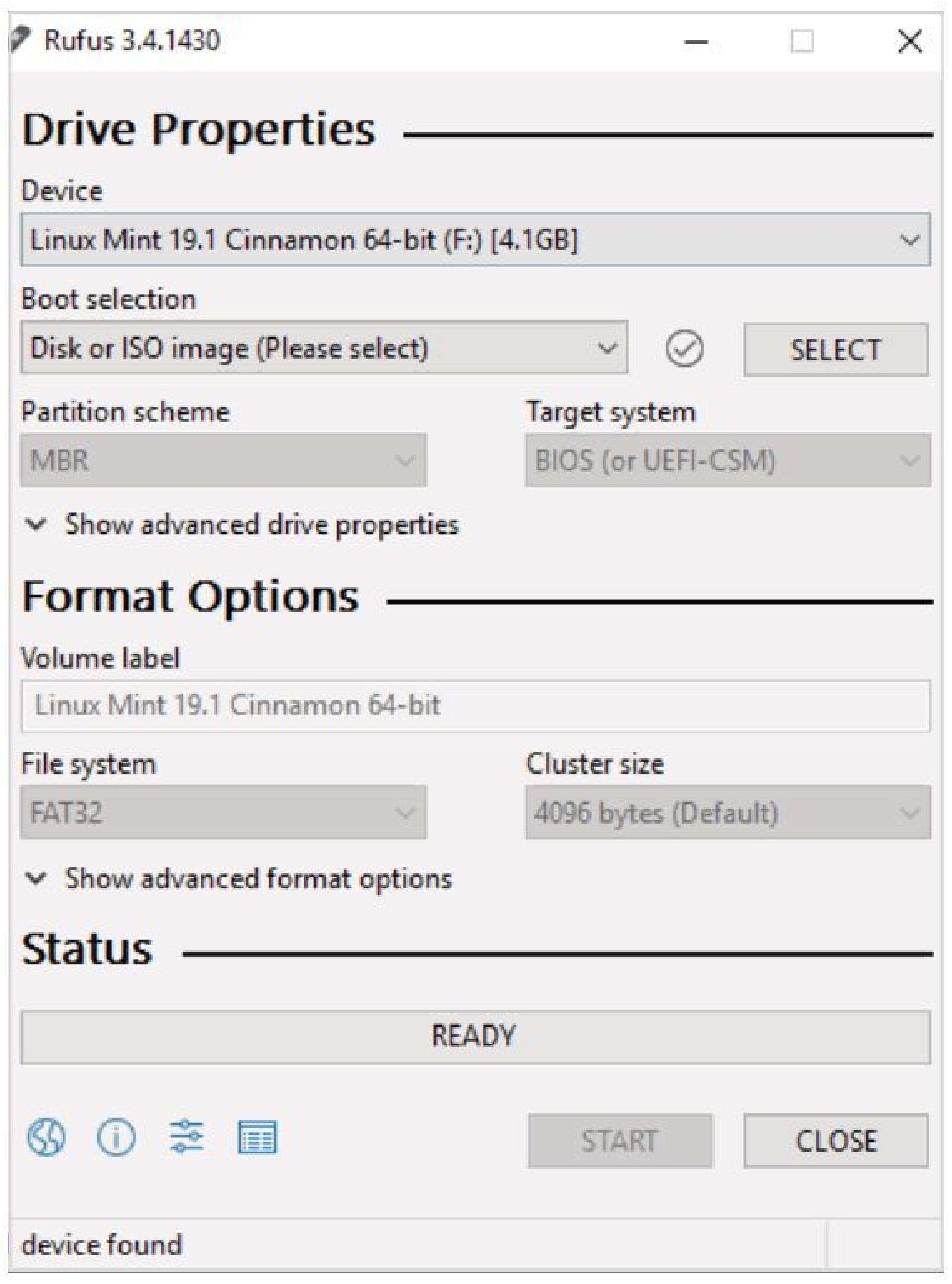
## USB BOOTABLE MEDIA

**USB media is faster than a DVD and often more convenient, as most modern PCs don't have an optical drive installed. The process of transferring the image is easy but you need a third-party app first and a USB flash drive of 4GB or more.**

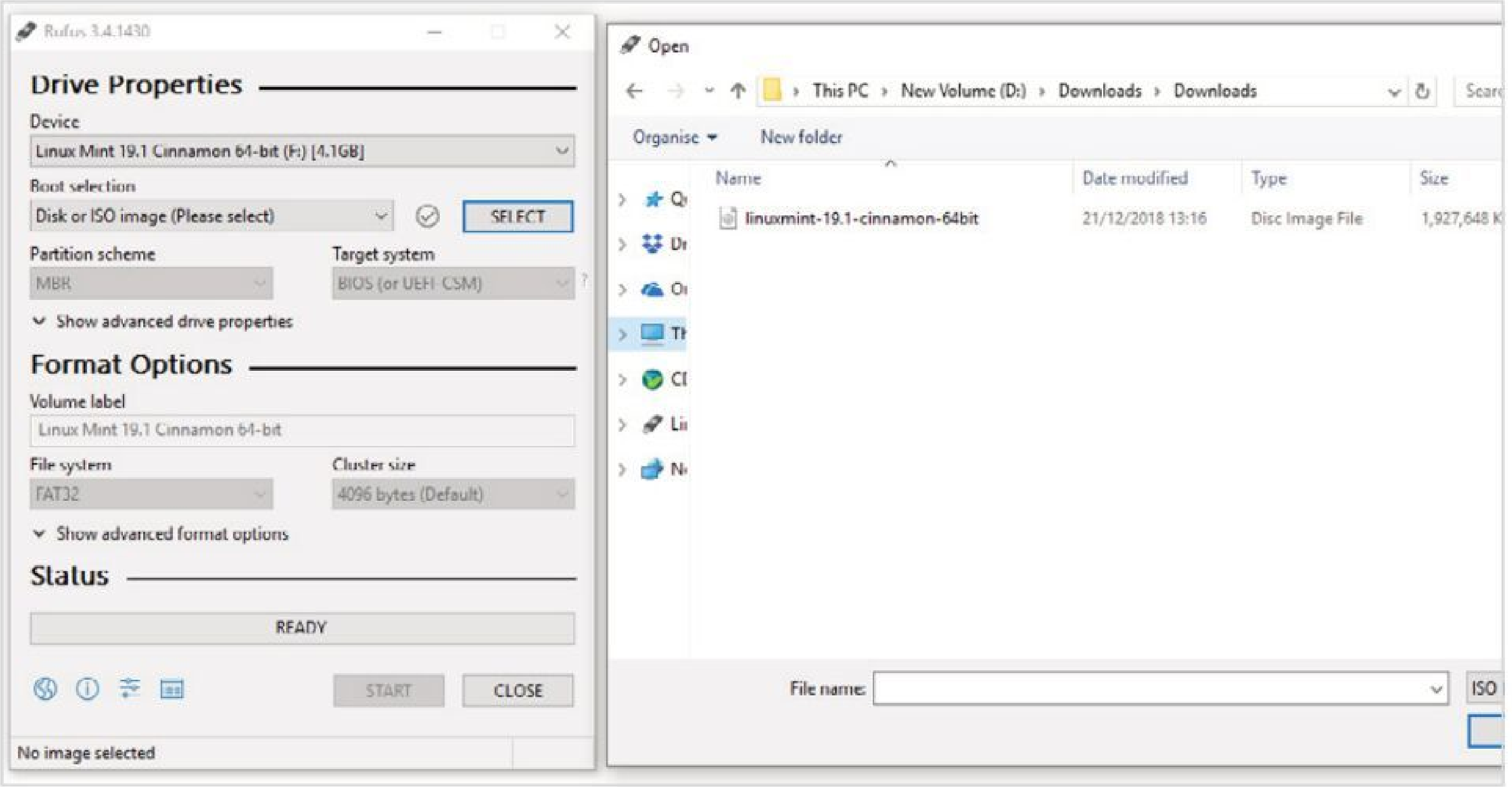
**STEP 1** First open up a web browser and go to **www.rufus.akeo.ie/**. Scroll down the page a little and you come to a Download heading, under which is the latest version of Rufus. Left click the link to start the download.


Rufus 3.0.1304
Drive Properties
Device: Ubuntu 18.04 LTS amd64 (G:) [8GB]
Boot selection: ubuntu-18.04-desktop-amd64.iso
Partition scheme: MBR
Target system: BIOS or UEFI
Format Options
Volume label: Ubuntu 18.04 LTS amd64
File system: FAT32 (Default)
Cluster size: 4096 bytes (Default)
Status: READY
1 device found 00:00:22

**STEP 2** Double-click the downloaded Rufus executable and click Yes to the Windows security question and Yes to checking for updates. With Rufus launched it should have already identified your inserted USB flash drive; if not, just remove and reinsert.


Rufus 3.4.1430
Drive Properties
Device: Linux Mint 19.1 Cinnamon 64-bit (F:) [4.1GB]
Boot selection: Disk or ISO image (Please select)
Partition scheme: MBR
Target system: BIOS (or UEFI-CSM)
Format Options
Volume label: Linux Mint 19.1 Cinnamon 64-bit
File system: FAT32
Cluster size: 4096 bytes (Default)
Status: READY
device found

**STEP 3** At first glance the Rufus interface can look a little confusing but don't worry, it's really quite simple. To begin with, click on the SELECT button next to the 'Disk or ISO Image (Please select)' pull-down menu. This launches a Windows Explorer window where you can locate and select the Linux ISO.

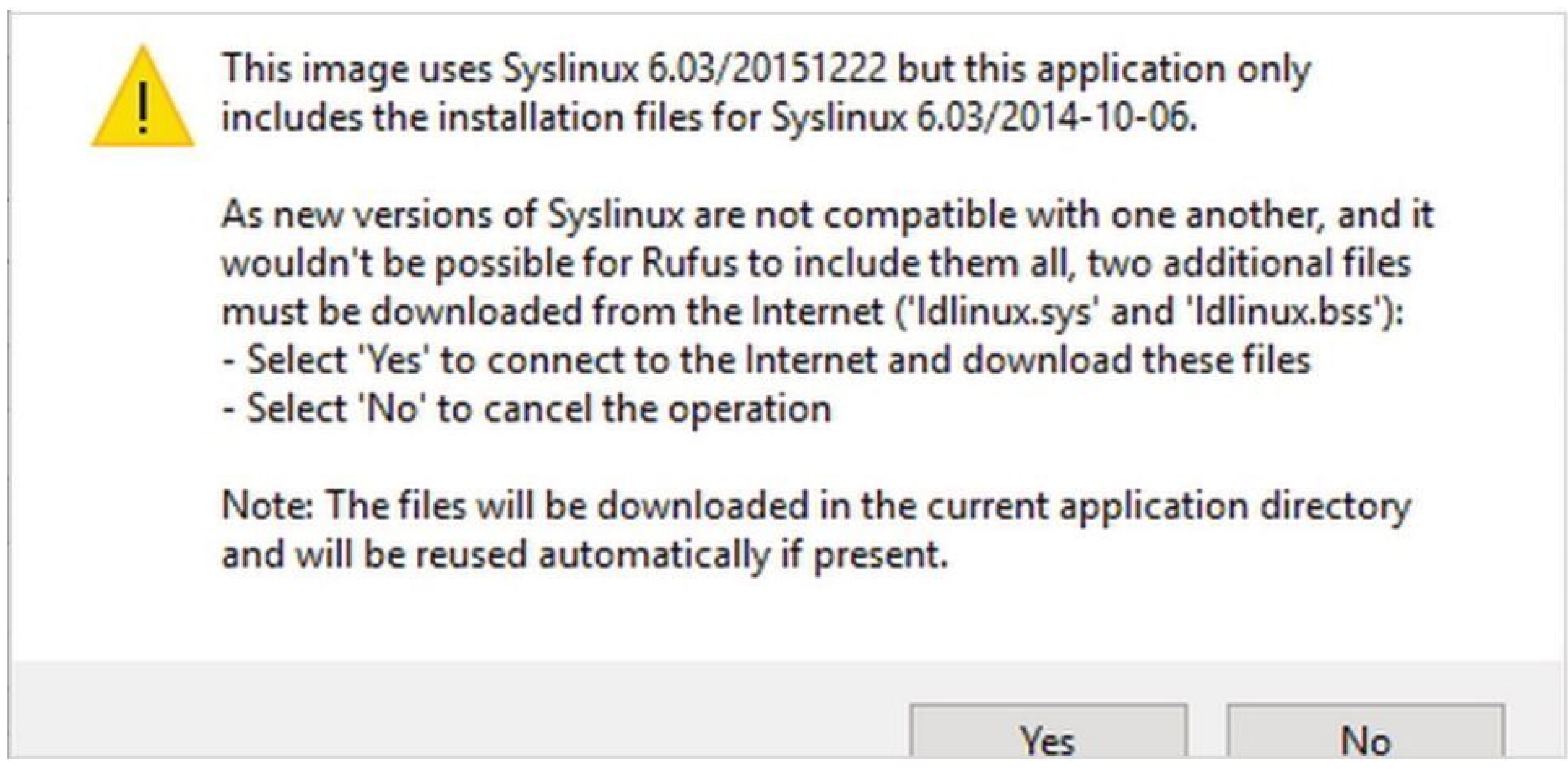

Rufus 3.4.1430
Drive Properties
Device: Linux Mint 19.1 Cinnamon 64-bit (F:) [4.1GB]
Boot selection: Disk or ISO image (Please select)
Partition scheme: MBR
Target system: BIOS (or UEFI-CSM)
Format Options
Volume label: Linux Mint 19.1 Cinnamon 64-bit
File system: FAT32
Cluster size: 4096 bytes (Default)
Status: READY
No image selected

Open
This PC › New Volume (D:) › Downloads › Downloads

| Name | Date modified | Type | Size |
|---|---|---|---|
| linuxmint-19.1-cinnamon-64bit | 21/12/2018 13:16 | Disc Image File | 1,927,648 K |

File name:

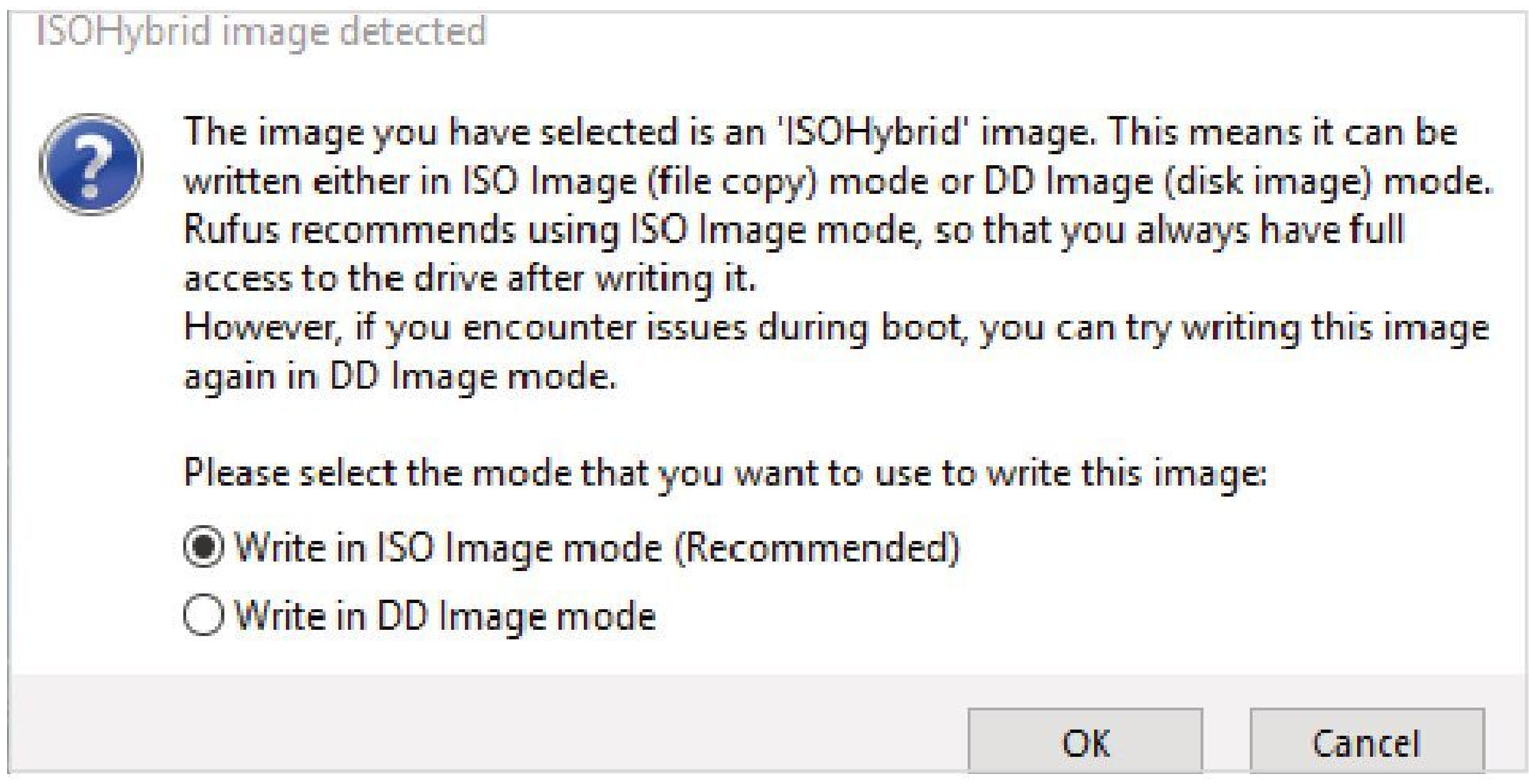
**STEP 4** When you're ready, click on the Start button at the bottom of the Rufus app. This may open up another dialogue box asking you to download and use a new version of SysLinux. SysLinux is a selection of boot loaders, used to allow a modern PC to access and boot from a USB flash drive. It is necessary, so if asked click on 'Yes' to continue.


This image uses Syslinux 6.03/20151222 but this application only includes the installation files for Syslinux 6.03/2014-10-06.

As new versions of Syslinux are not compatible with one another, and it wouldn't be possible for Rufus to include them all, two additional files must be downloaded from the Internet ('ldlinux.sys' and 'ldlinux.bss'):
- Select 'Yes' to connect to the Internet and download these files
- Select 'No' to cancel the operation

Note: The files will be downloaded in the current application directory and will be reused automatically if present.

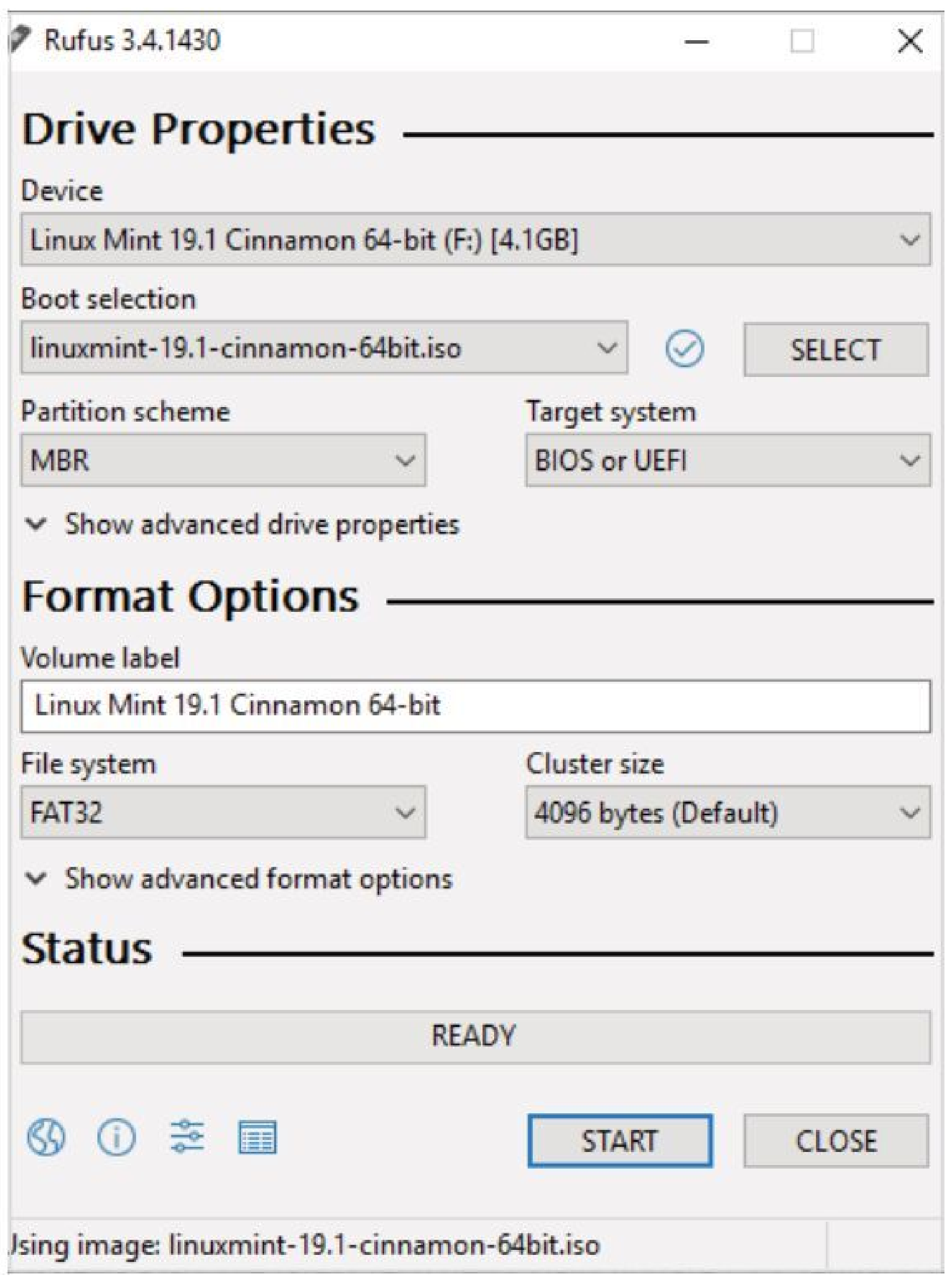
**STEP 5** The next step asks which image mode you want the Linux ISO to be written to the USB flash drive in. Both methods work for different situations but generally, the recommended ISO Image Mode is the more popular. Make sure this mode is preselected and click OK to continue, followed by OK again to confirm the action.


ISOHybrid image detected

The image you have selected is an 'ISOHybrid' image. This means it can be written either in ISO Image (file copy) mode or DD Image (disk image) mode.
Rufus recommends using ISO Image mode, so that you always have full access to the drive after writing it.
However, if you encounter issues during boot, you can try writing this image again in DD Image mode.

Please select the mode that you want to use to write this image:
● Write in ISO Image mode (Recommended)
○ Write in DD Image mode

**STEP 6** The Linux ISO is now transferred to the USB flash drive. The process shouldn't take too long, again depending on the speed of the USB device and the PC. You may find Rufus auto-opens the USB drive in Windows Explorer during the process; don't worry you can minimise or close it if you want. When the process is complete, click on the Close button.


Rufus 3.4.1430
Drive Properties
Device: Linux Mint 19.1 Cinnamon 64-bit (F:) [4.1GB]
Boot selection: linuxmint-19.1-cinnamon-64bit.iso
Partition scheme: MBR
Target system: BIOS or UEFI
Format Options
Volume label: Linux Mint 19.1 Cinnamon 64-bit
File system: FAT32
Cluster size: 4096 bytes (Default)
Status: READY
Jsing image: linuxmint-19.1-cinnamon-64bit.iso

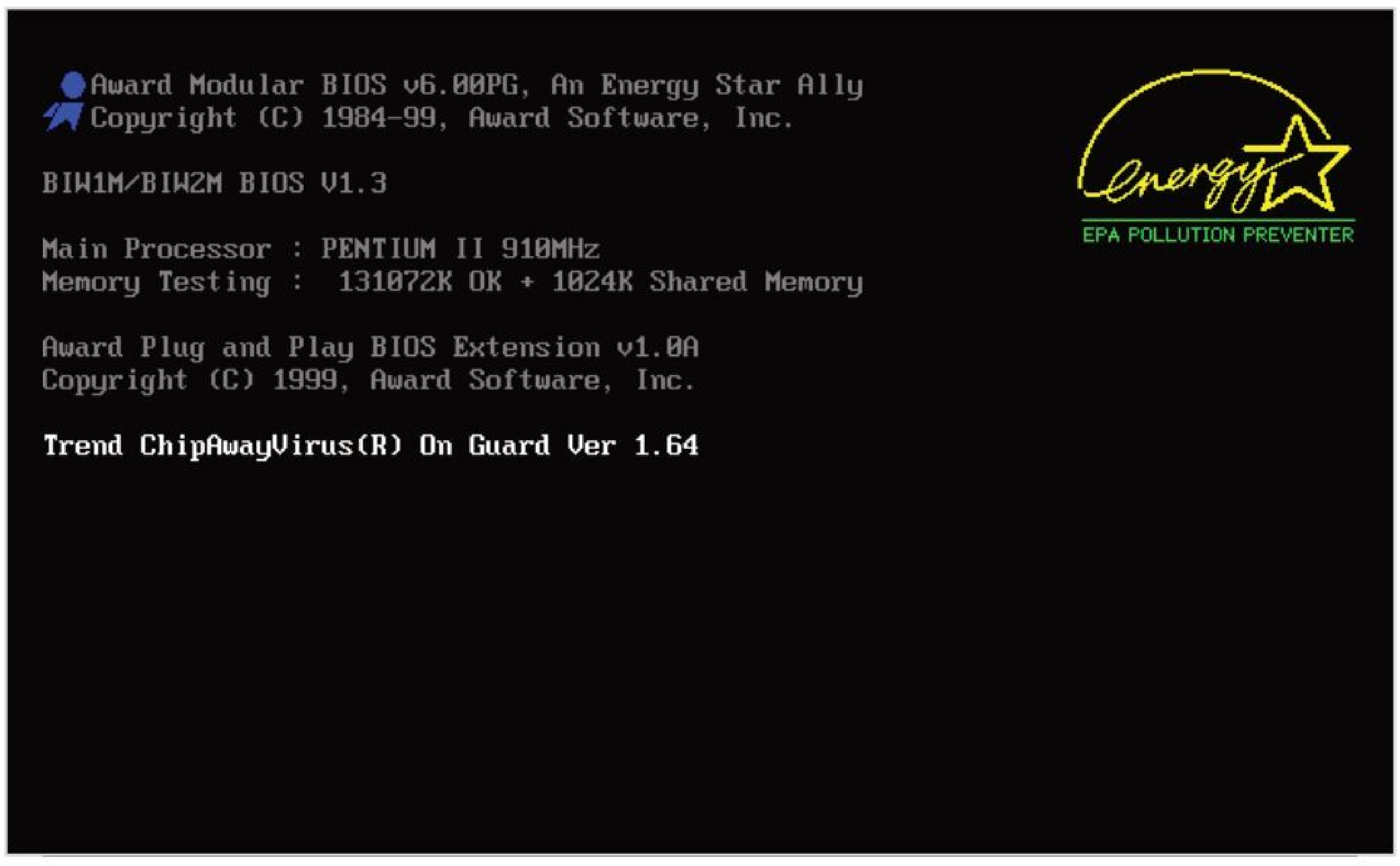
# Installing Linux on a PC

Most Linux distros come as a Live Environment. This means you can boot into an actual, fully-working distro straight from the DVD or USB that you just created. Let's see how that works and how you go about installing Linux from there.

## UEFI BIOS

**The Unified Extensible Firmware Interface (UEFI) is used to identify hardware and protect a PC during its boot-up process. It replaces the traditional BIOS but can cause issues when installing Linux.**

**STEP 1** Insert your DVD or USB flash drive into your PC and, if you haven't already, shutdown Windows. In this instance we're using the USB boot media but the process is virtually identical. Start the PC and when prompted press the appropriate keys to enter the BIOS or SETUP, which could for example be: F2, Del or even F12.



```
Award Modular BIOS v6.00PG, An Energy Star Ally
Copyright (C) 1984-99, Award Software, Inc.

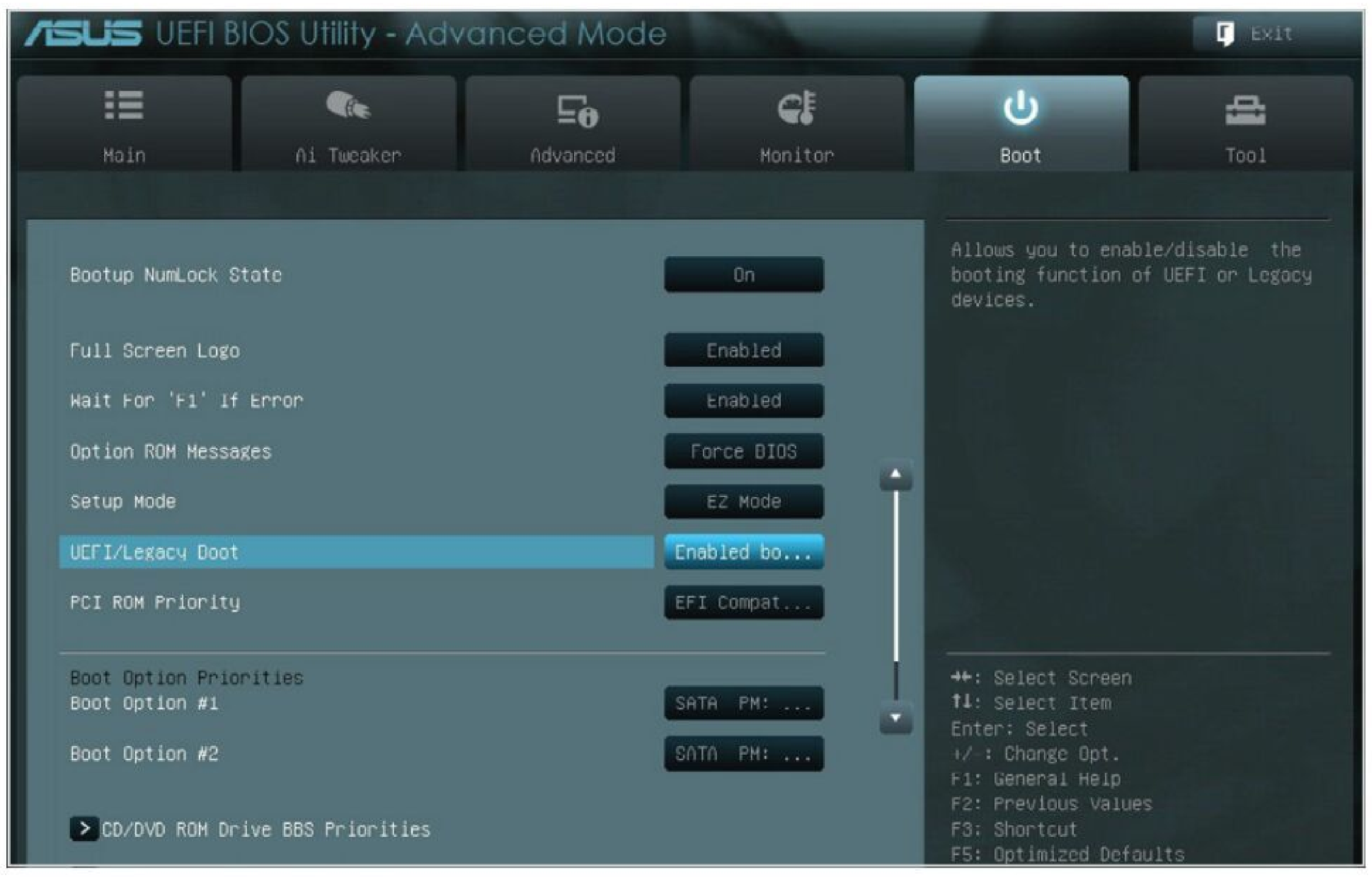
BIW1M/BIW2M BIOS V1.3

Main Processor : PENTIUM II 910MHz
Memory Testing :  131072K OK + 1024K Shared Memory

Award Plug and Play BIOS Extension v1.0A
Copyright (C) 1999, Award Software, Inc.

Trend ChipAwayVirus(R) On Guard Ver 1.64
```

**STEP 2** There are different versions of a UEFI BIOS, so covering them all would be impossible. What you're looking for is a section that details the Boot Sequence or Boot Mode. Here you have the option to turn off UEFI and choose Legacy or disable Secure Booting. Most distros work with UEFI but it can be a tricky process to enable it to boot.



```
Bootup NumLock State               On
Full Screen Logo                   Enabled
Wait For 'F1' If Error             Enabled
Option ROM Messages                Force BIOS
Setup Mode                         EZ Mode
UEFI/Legacy Boot                   Enabled bo...
PCI ROM Priority                   EFI Compat...

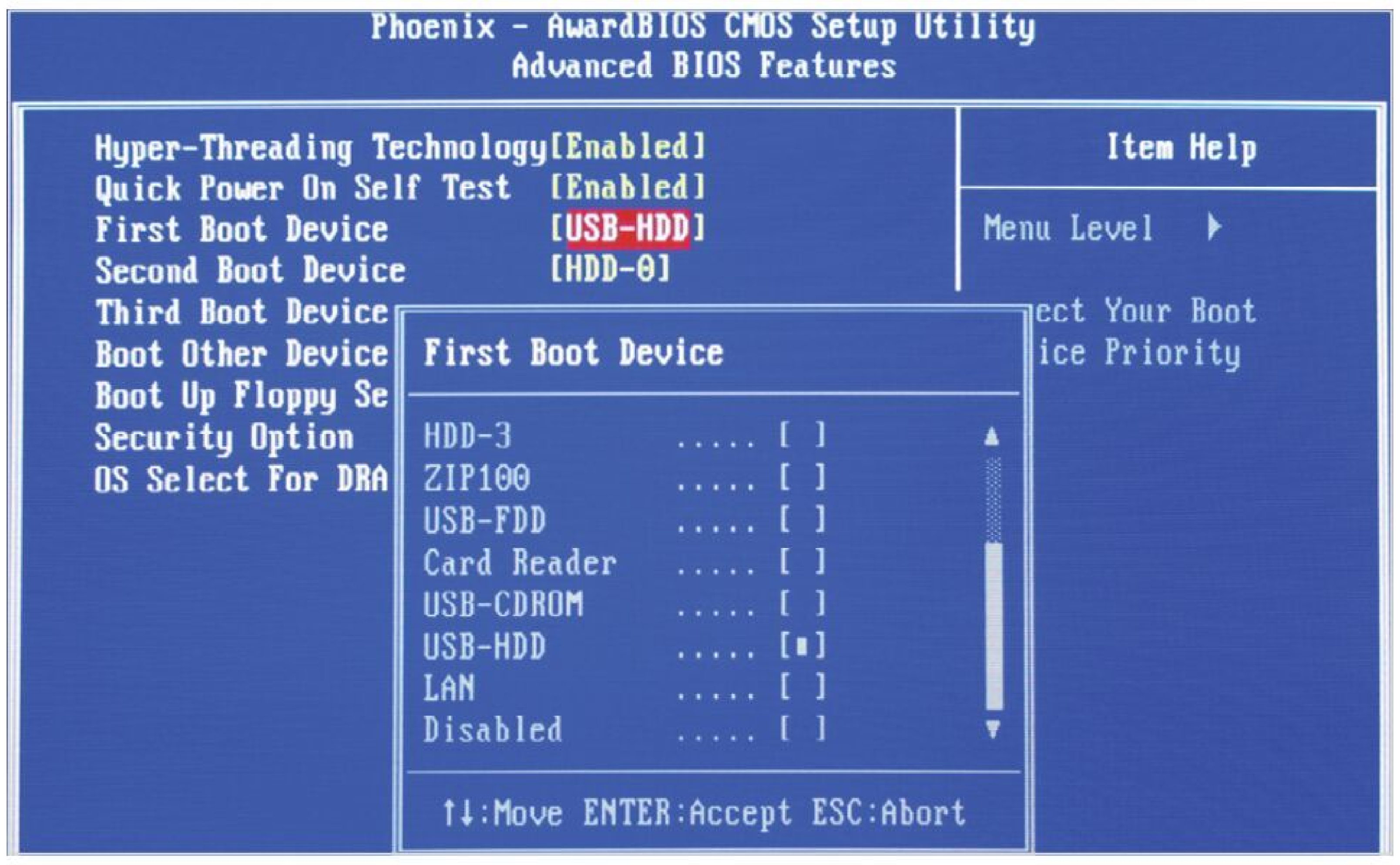
Boot Option Priorities
Boot Option #1                     SATA  PM: ...
Boot Option #2                     SATA  PM: ...

> CD/DVD ROM Drive BBS Priorities

Allows you to enable/disable  the
booting function of UEFI or Legacy
devices.

→←: Select Screen
↑↓: Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F3: Shortcut
F5: Optimized Defaults
```

**STEP 3** With UEFI turned to Legacy mode, there are now two ways of booting into the Live Environment. The first is via the BIOS you're already in. Locate the Boot Sequence and change the first boot device from its original setting, usually Internal HDD or similar, to: USB Storage Device for the USB media option, or DVD Drive for the DVD media option.

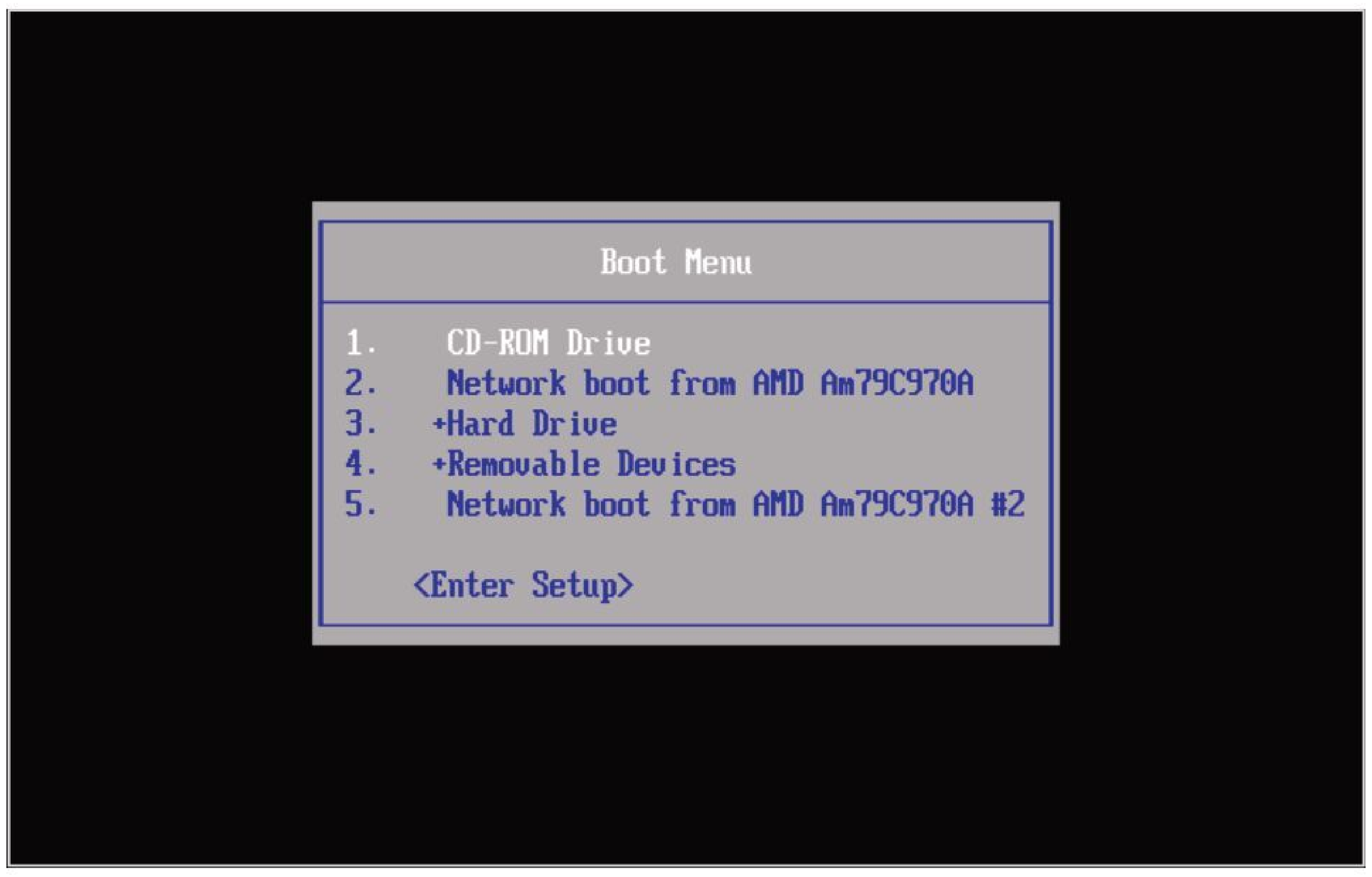


```
              Phoenix - AwardBIOS CMOS Setup Utility
                     Advanced BIOS Features

  Hyper-Threading Technology[Enabled]          Item Help
  Quick Power On Self Test  [Enabled]
  First Boot Device         [USB-HDD]      Menu Level   ▶
  Second Boot Device        [HDD-0]
  Third Boot Device                        ect Your Boot
  Boot Other Device  First Boot Device     ice Priority
  Boot Up Floppy Se
  Security Option    HDD-3        ..... [ ]
  OS Select For DRA  ZIP100       ..... [ ]
                     USB-FDD      ..... [ ]
                     Card Reader  ..... [ ]
                     USB-CDROM    ..... [ ]
                     USB-HDD      ..... [■]
                     LAN          ..... [ ]
                     Disabled     ..... [ ]

                      ↑↓:Move ENTER:Accept ESC:Abort
```

**STEP 4** Alternatively use the Boot Option Menu. With this option you can press F12 (or something similar) to display a list of boot media options; from there, you can choose the appropriate boot media. Either way, you can now Save and Exit the BIOS by navigating to the Save & Exit option and choosing 'Save Changes and Exit'.



```
                Boot Menu

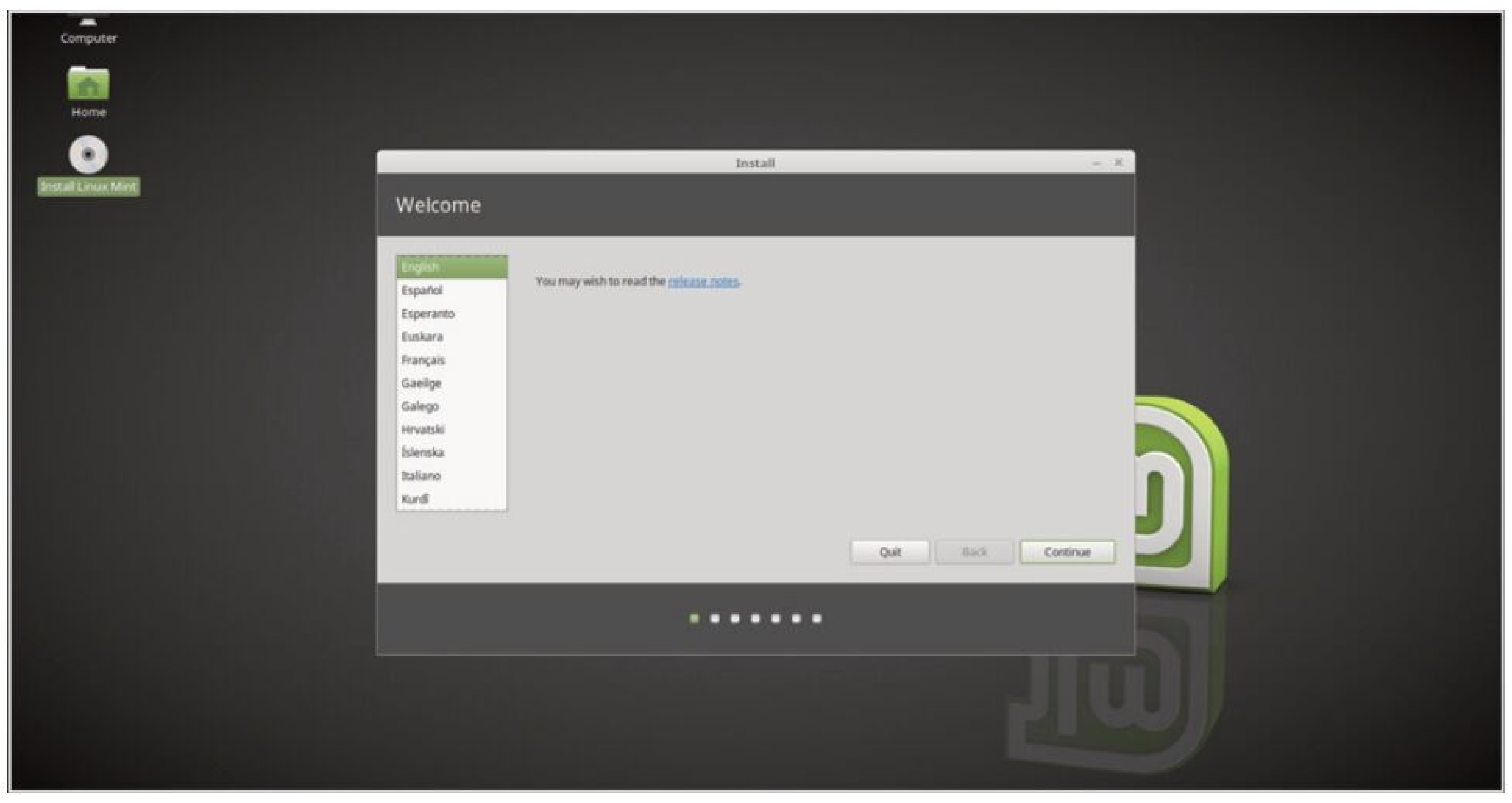
1.    CD-ROM Drive
2.    Network boot from AMD Am79C970A
3.   +Hard Drive
4.   +Removable Devices
5.    Network boot from AMD Am79C970A #2

    <Enter Setup>
```

# INSTALLING LINUX

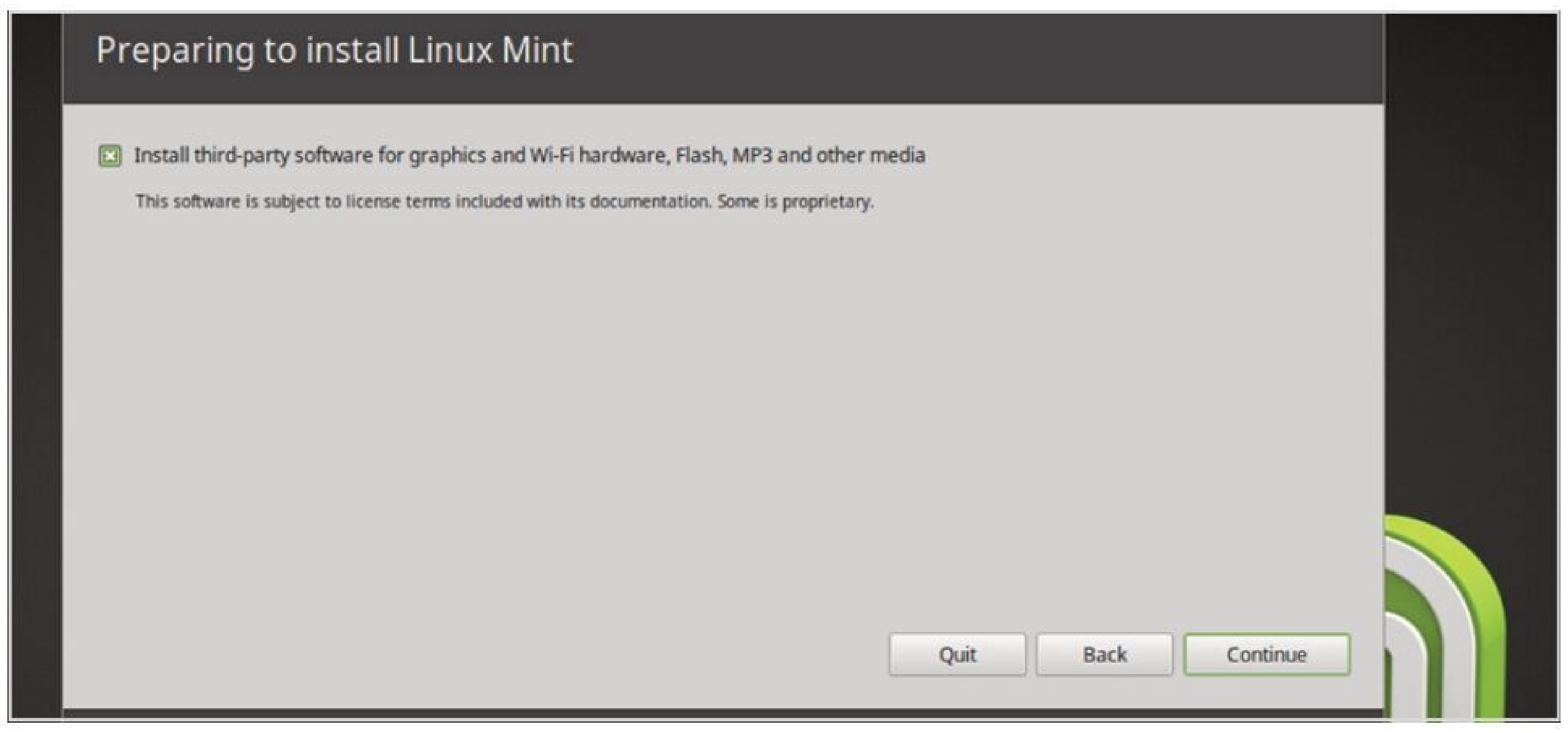
**Once the Live Environment has booted, you see the option to install the distro to your computer. Have a look around and when you're ready, look for the Install option on the desktop.**

**STEP 1** Providing you're connected to the internet (if not, then do so now) and you're in the Live Environment, start the installation process by double-clicking on the Install Linux Mint icon on the desktop. Other distros display their own name, of course, but the process is the same. Click Continue when you're ready.



You may wish to read the release notes.

**STEP 2** While the installation process is very similar across most Linux distros, some offer different questions during the installation. Generally, the questions aren't too difficult, nothing very technical, but some such as 'Installing third-party software…' can be confusing. In this case you can click Continue but if you're unsure, have an Internet-connected device available to ask any questions.

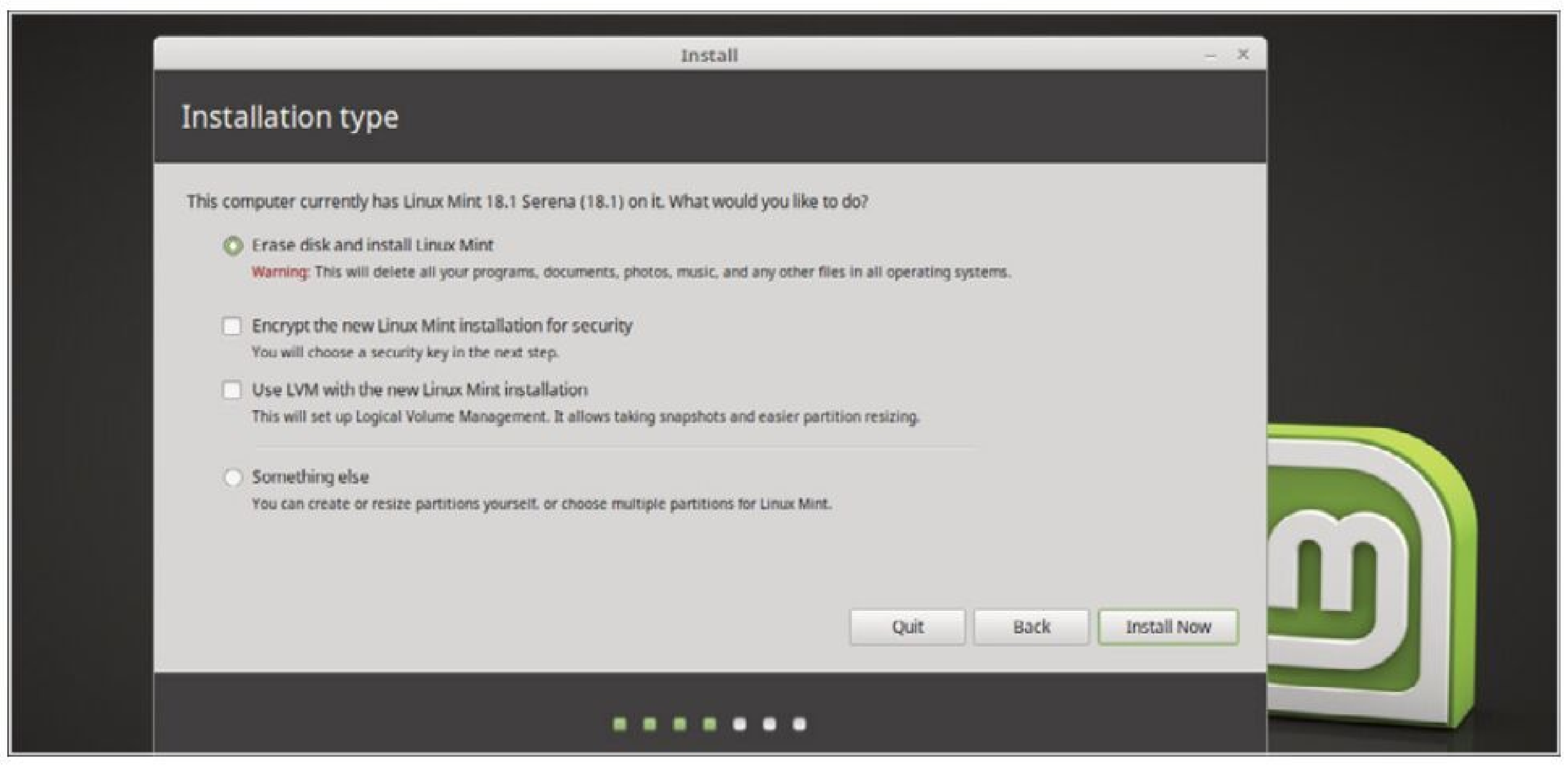


Preparing to install Linux Mint

☒ Install third-party software for graphics and Wi-Fi hardware, Flash, MP3 and other media

This software is subject to license terms included with its documentation. Some is proprietary.

**STEP 3** When installing a new operating system it's recommended that you wipe the old OS, replacing it with the new. When you reach this stage of the installation process, ensure the 'Erase disk and install Linux…' option is selected. NOTE: This completely wipes Windows 10 from your computer, so make sure you have backups of all your personal files and data.



Installation type

This computer currently has Linux Mint 18.1 Serena (18.1) on it. What would you like to do?

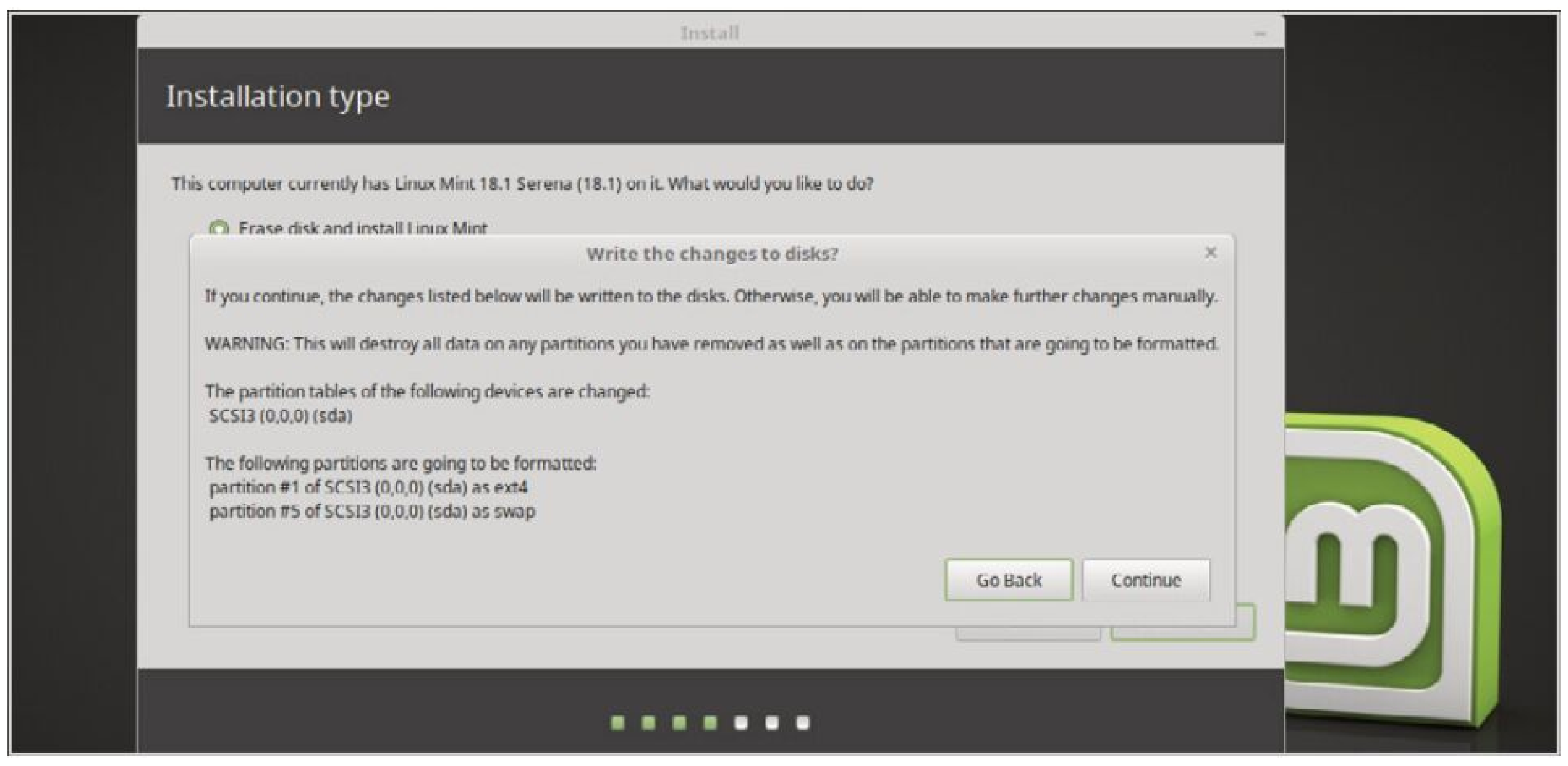
● Erase disk and install Linux Mint
Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.

☐ Encrypt the new Linux Mint installation for security
You will choose a security key in the next step.

☐ Use LVM with the new Linux Mint installation
This will set up Logical Volume Management. It allows taking snapshots and easier partition resizing.

○ Something else
You can create or resize partitions yourself, or choose multiple partitions for Linux Mint.

**STEP 4** Before the installation process begins, you're asked if the choice you made regarding the erasure of the hard drive is correct. This is your last chance to back out. If you're certain you don't mind wiping everything and starting again with Linux Mint, click Continue. If you need to backup your files remove the Linux disc/USB, reboot, backup and start again.



Installation type

This computer currently has Linux Mint 18.1 Serena (18.1) on it. What would you like to do?

● Erase disk and install Linux Mint

Write the changes to disks?

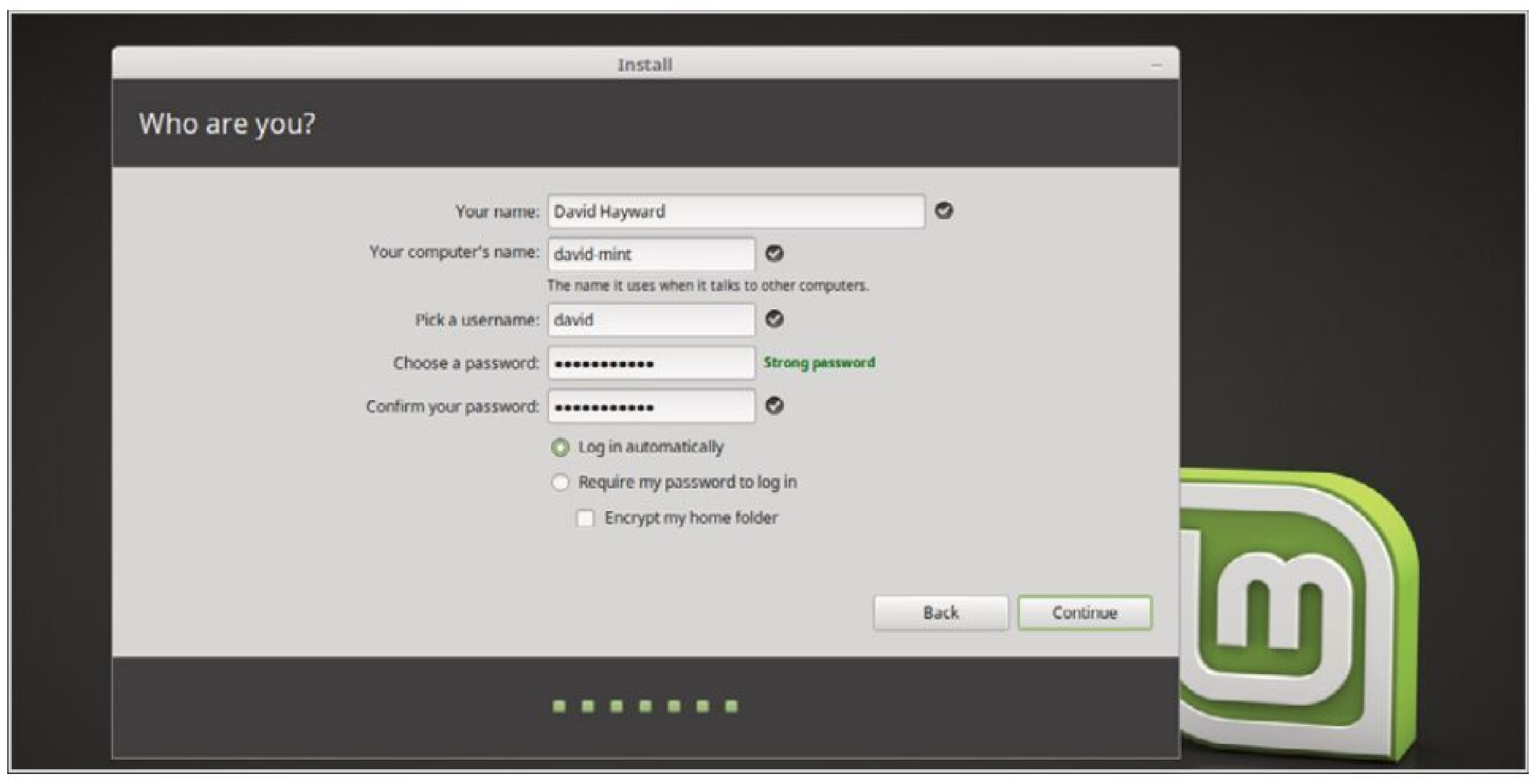
If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.

WARNING: This will destroy all data on any partitions you have removed as well as on the partitions that are going to be formatted.

The partition tables of the following devices are changed:
SCSI3 (0,0,0) (sda)

The following partitions are going to be formatted:
partition #1 of SCSI3 (0,0,0) (sda) as ext4
partition #5 of SCSI3 (0,0,0) (sda) as swap

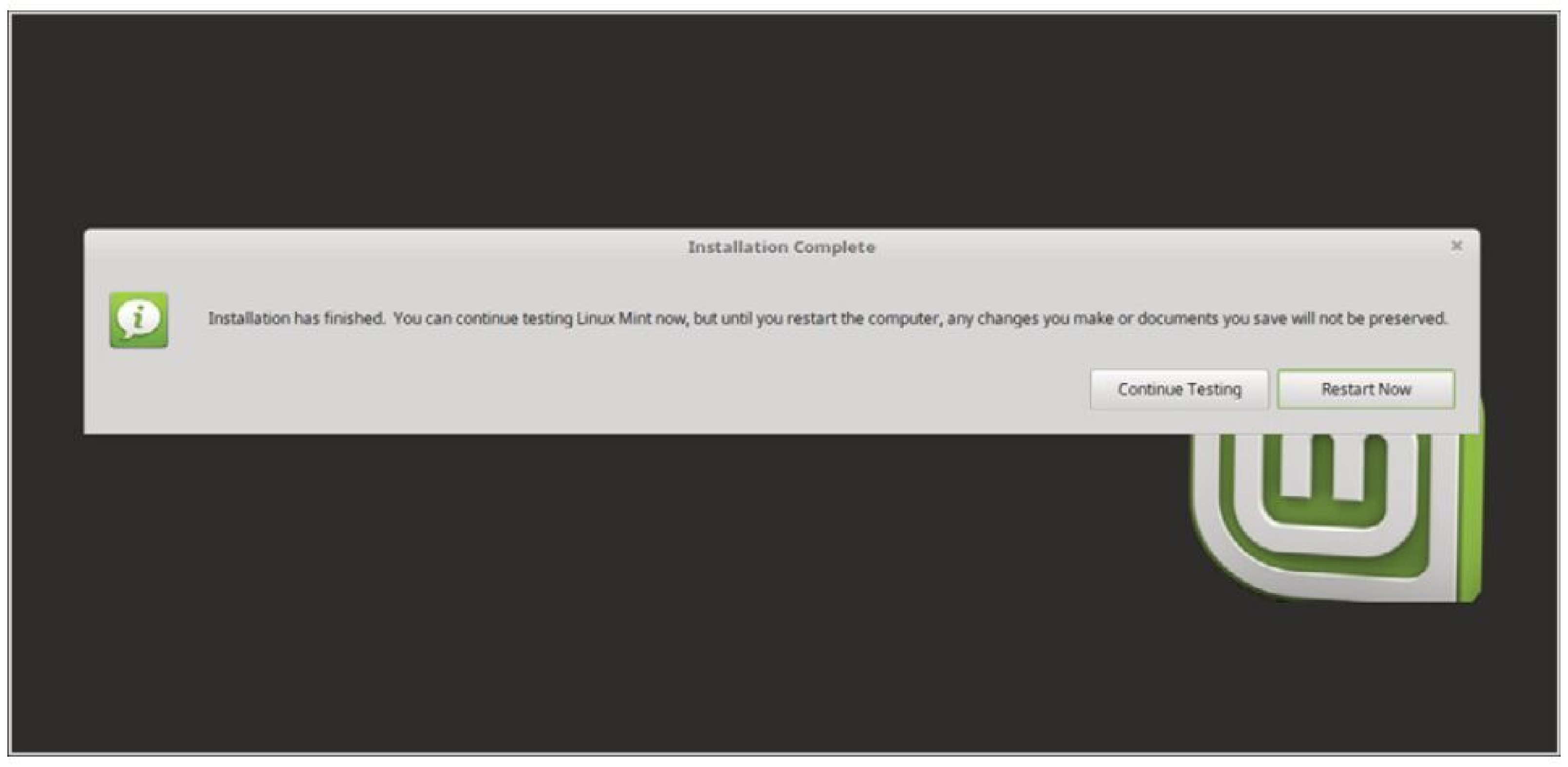
**STEP 5** Eventually you are asked to set up your Linux username and password. Enter your Name to begin with, then the Computer Name, which is the name it is identified on the network as. Next choose a Username, followed by a good Password. You can tick the Login Automatically option but leave the Encrypt Home Folder option for now.



Who are you?

Your name: David Hayward ✓
Your computer's name: david-mint ✓
The name it uses when it talks to other computers.
Pick a username: david ✓
Choose a password: •••••••••••• Strong password
Confirm your password: •••••••••••• ✓
● Log in automatically
○ Require my password to log in
☐ Encrypt my home folder

**STEP 6** The installation process can be quick, and there may be more questions to answer, or it may simply start installing Linux based on your previous answers. Either way, you end up being asked to Continue Testing the Live Environment or Restarting to use the newly installed OS. If you're ready to use Linux, then click Restart Now.



Installation Complete

Installation has finished. You can continue testing Linux Mint now, but until you restart the computer, any changes you make or documents you save will not be preserved.

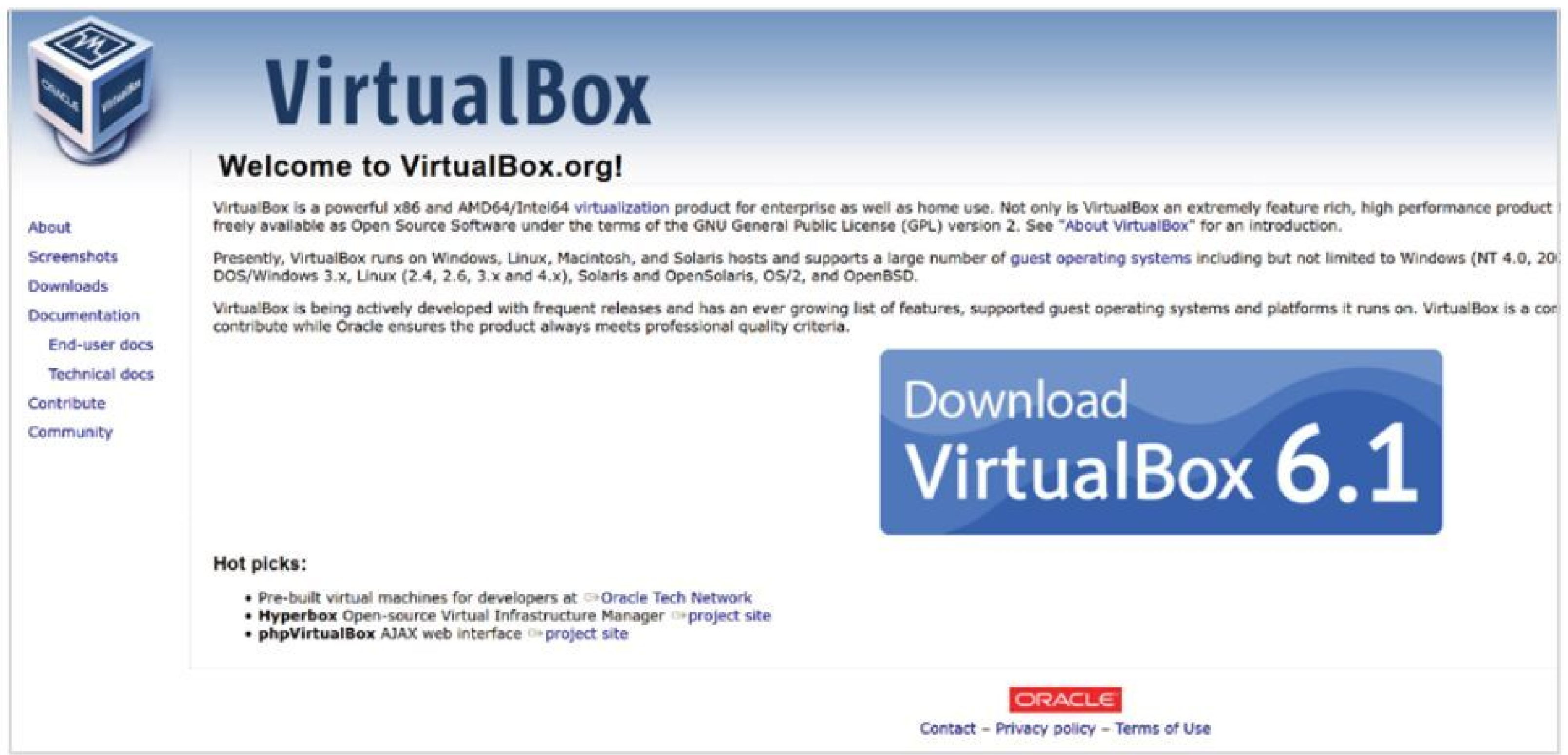
# Installing a Virtual Environment

A Virtual Environment is a simulated computer system. Using a Virtual Machine, you can mimic a standard PC and install an entire operating system to it without affecting the one installed on your computer. It's a great way to test and use Linux, while still having Windows 10 as your main OS.

## GOING VIRTUAL

**Using a Virtual Machine (VM) takes resources from your computer: memory, hard drive space, processor usage and so on. Make sure you have enough of each before commencing.**

**STEP 1** We're using VirtualBox in this instance, as it's one of the easiest virtual environments to get to grips with. Enter www.virtualbox.org and click on 'Download VirtualBox'. This takes you to the main download page. Locate the correct host for your system: Windows or Mac, the Host being the current installed operating system, and click the link to begin the download.



**Welcome to VirtualBox.org!**

VirtualBox is a powerful x86 and AMD64/Intel64 virtualization product for enterprise as well as home use. Not only is VirtualBox an extremely feature rich, high performance product freely available as Open Source Software under the terms of the GNU General Public License (GPL) version 2. See "About VirtualBox" for an introduction.

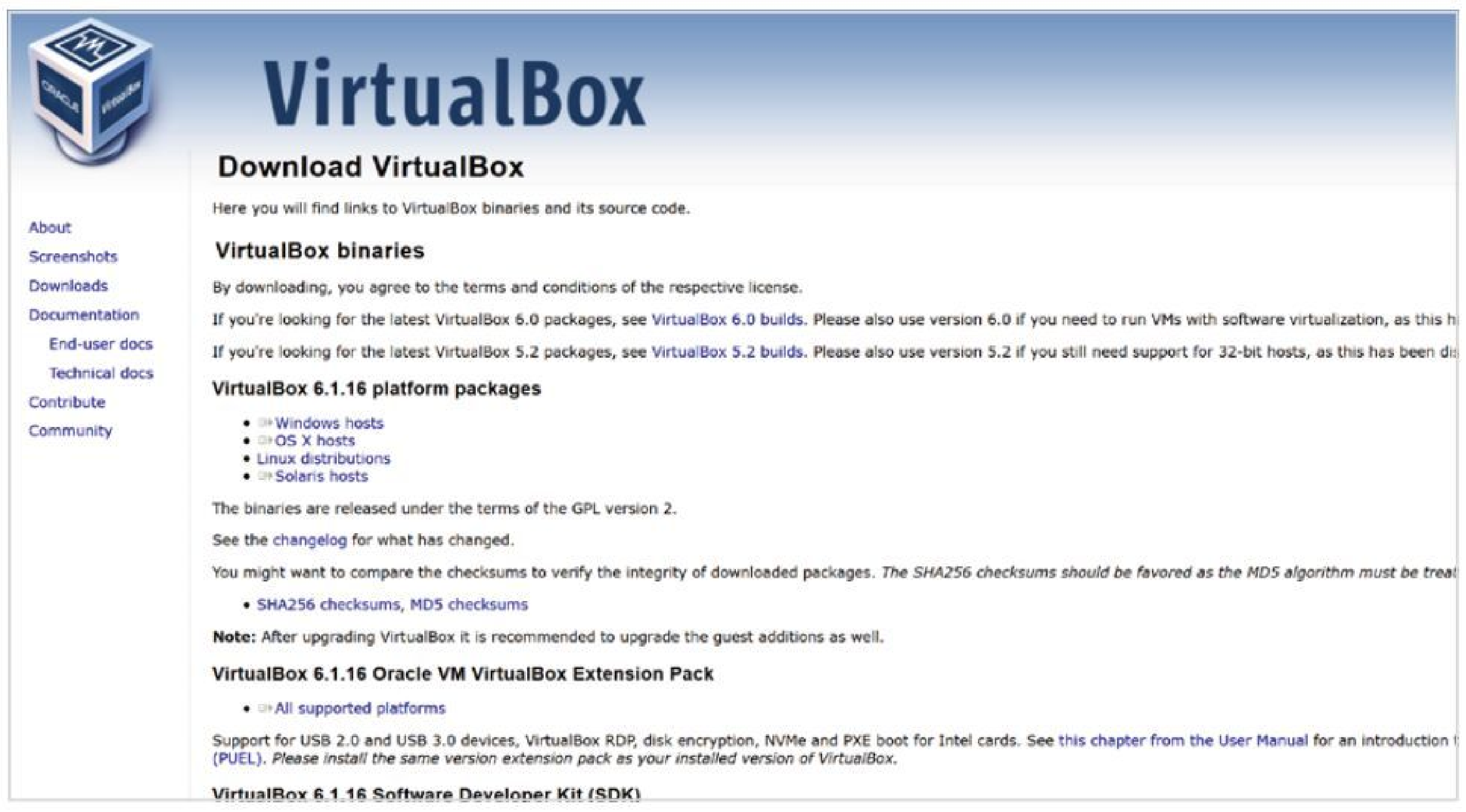
Presently, VirtualBox runs on Windows, Linux, Macintosh, and Solaris hosts and supports a large number of guest operating systems including but not limited to Windows (NT 4.0, 20 DOS/Windows 3.x, Linux (2.4, 2.6, 3.x and 4.x), Solaris and OpenSolaris, OS/2, and OpenBSD.

VirtualBox is being actively developed with frequent releases and has an ever growing list of features, supported guest operating systems and platforms it runs on. VirtualBox is a cor contribute while Oracle ensures the product always meets professional quality criteria.

**Hot picks:**

- Pre-built virtual machines for developers at Oracle Tech Network
- **Hyperbox** Open-source Virtual Infrastructure Manager project site
- **phpVirtualBox** AJAX web interface project site

**STEP 2** Next, while still at the VirtualBox download page, locate the VirtualBox Extension Pack link. The Extension Pack supports USB devices as well as numerous other extras that can help make the VM environment a more accurate emulation of a 'real' computer.



**Download VirtualBox**

Here you will find links to VirtualBox binaries and its source code.

**VirtualBox binaries**

By downloading, you agree to the terms and conditions of the respective license.

If you're looking for the latest VirtualBox 6.0 packages, see VirtualBox 6.0 builds. Please also use version 6.0 if you need to run VMs with software virtualization, as this h

If you're looking for the latest VirtualBox 5.2 packages, see VirtualBox 5.2 builds. Please also use version 5.2 if you still need support for 32-bit hosts, as this has been di

**VirtualBox 6.1.16 platform packages**

- Windows hosts
- OS X hosts
- Linux distributions
- Solaris hosts

The binaries are released under the terms of the GPL version 2.

See the changelog for what has changed.

You might want to compare the checksums to verify the integrity of downloaded packages. *The SHA256 checksums should be favored as the MD5 algorithm must be treat*

- SHA256 checksums, MD5 checksums

**Note:** After upgrading VirtualBox it is recommended to upgrade the guest additions as well.

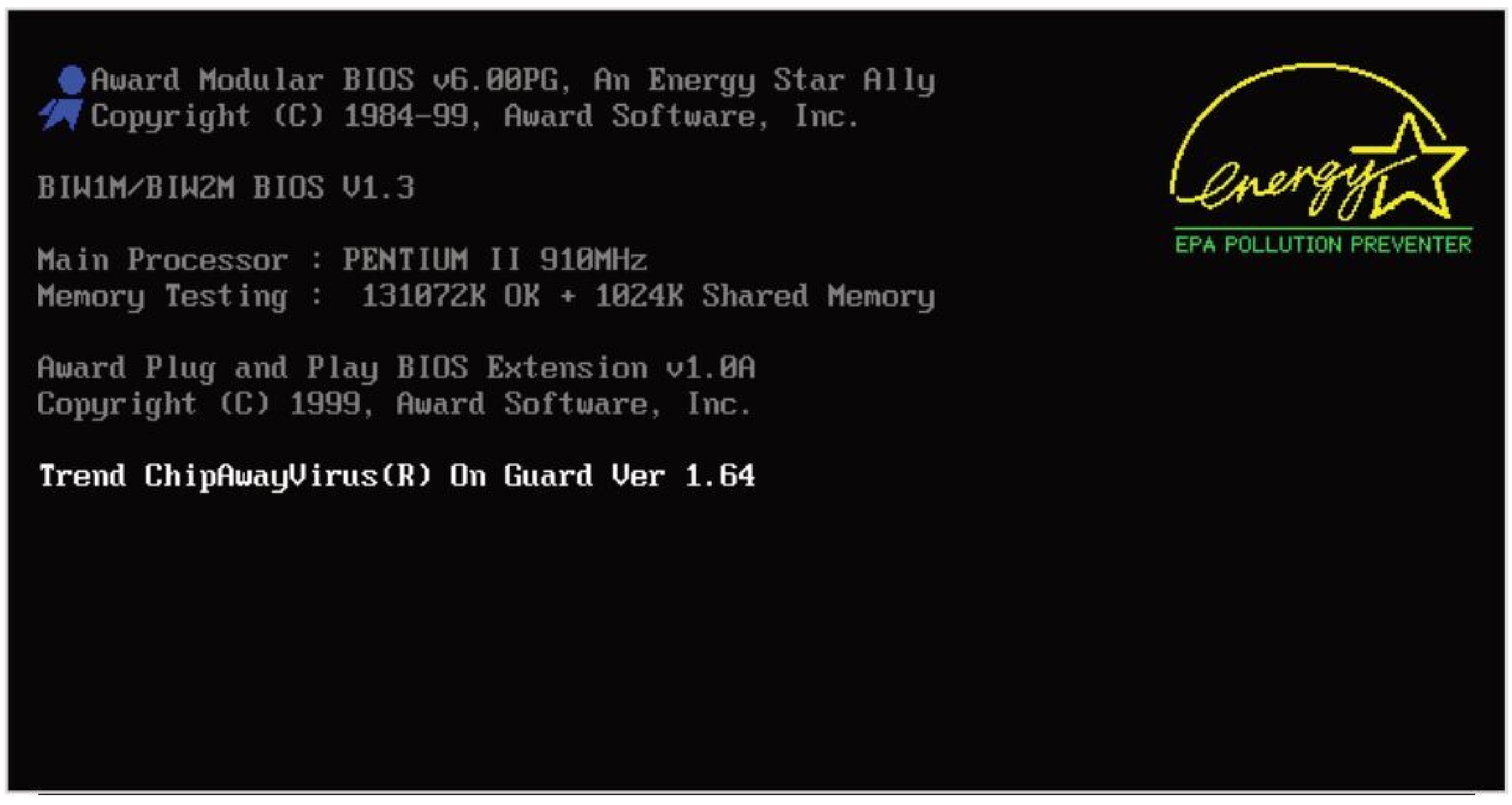
**VirtualBox 6.1.16 Oracle VM VirtualBox Extension Pack**

- All supported platforms

Support for USB 2.0 and USB 3.0 devices, VirtualBox RDP, disk encryption, NVMe and PXE boot for Intel cards. See this chapter from the User Manual for an introduction (PUEL). *Please install the same version extension pack as your installed version of VirtualBox.*

**VirtualBox 6.1.16 Software Developer Kit (SDK)**

**STEP 3** With the correct packages downloaded, and before you install anything, you need to make sure that the computer you're using is able to host a VM. To do this, reboot the computer and enter the BIOS. When the computer starts up, press the Del, F2 or whichever key is necessary to Enter Setup.



```
Award Modular BIOS v6.00PG, An Energy Star Ally
Copyright (C) 1984-99, Award Software, Inc.

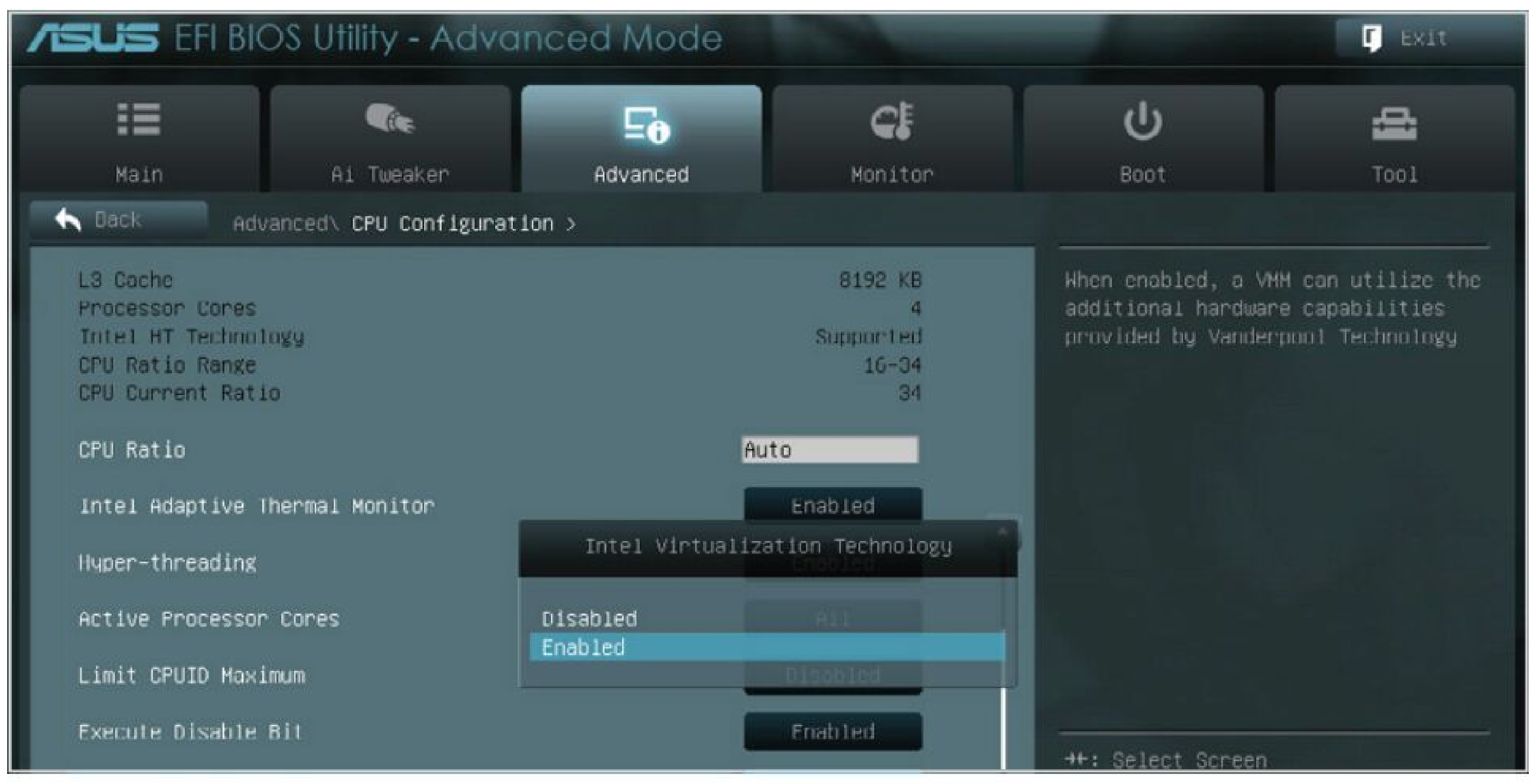
BIW1M/BIW2M BIOS V1.3

Main Processor : PENTIUM II 910MHz
Memory Testing :  131072K OK + 1024K Shared Memory

Award Plug and Play BIOS Extension v1.0A
Copyright (C) 1999, Award Software, Inc.

Trend ChipAwayVirus(R) On Guard Ver 1.64
```

**STEP 4** Each BIOS is laid out differently and it's very difficult to assess where to look in each personal example. However, as a general rule of thumb, you're looking for Intel Virtualisation Technology, or simply Virtualisation, found usually within the Advanced section of the BIOS. When you've located it, Enable it, save the settings, exit the BIOS and reboot the computer.


ASUS EFI BIOS Utility - Advanced Mode
Exit
Main
Ai Tweaker
Advanced
Monitor
Boot
Tool
Back
Advanced\ CPU Configuration >

```
L3 Cache                                   8192 KB
Processor Cores                                  4
Intel HT Technology                      Supported
CPU Ratio Range                              16-34
CPU Current Ratio                               34

CPU Ratio                          Auto

Intel Adaptive Thermal Monitor          Enabled

Hyper-threading

Active Processor Cores

Limit CPUID Maximum

Execute Disable Bit                     Enabled
```

Intel Virtualization Technology

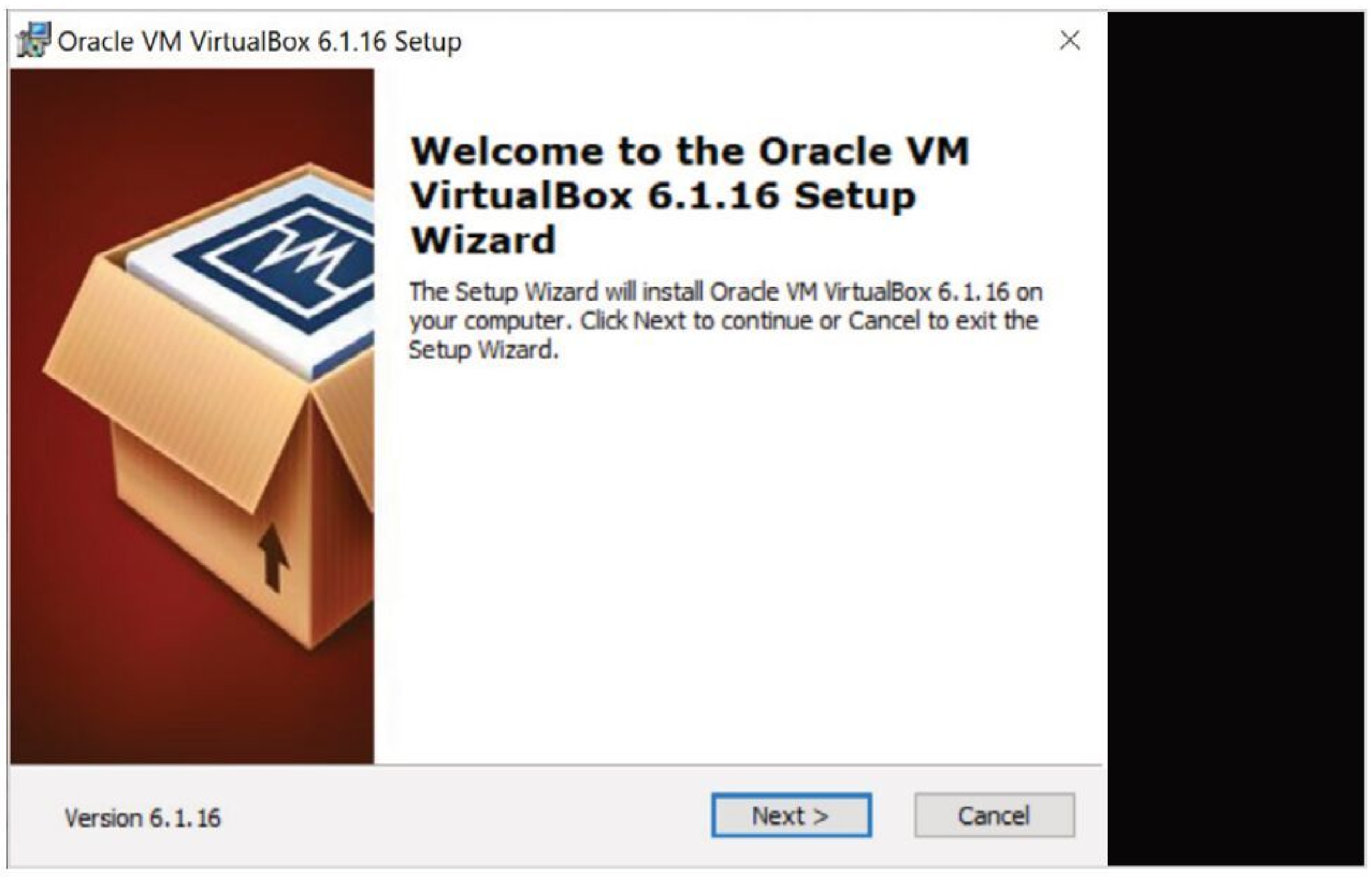
Disabled

Enabled

When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology

→←: Select Screen

**STEP 5** With the computer back up and running, locate the downloaded main VirtualBox application and double-click to begin the installation process. Click Next to continue, when you're ready.



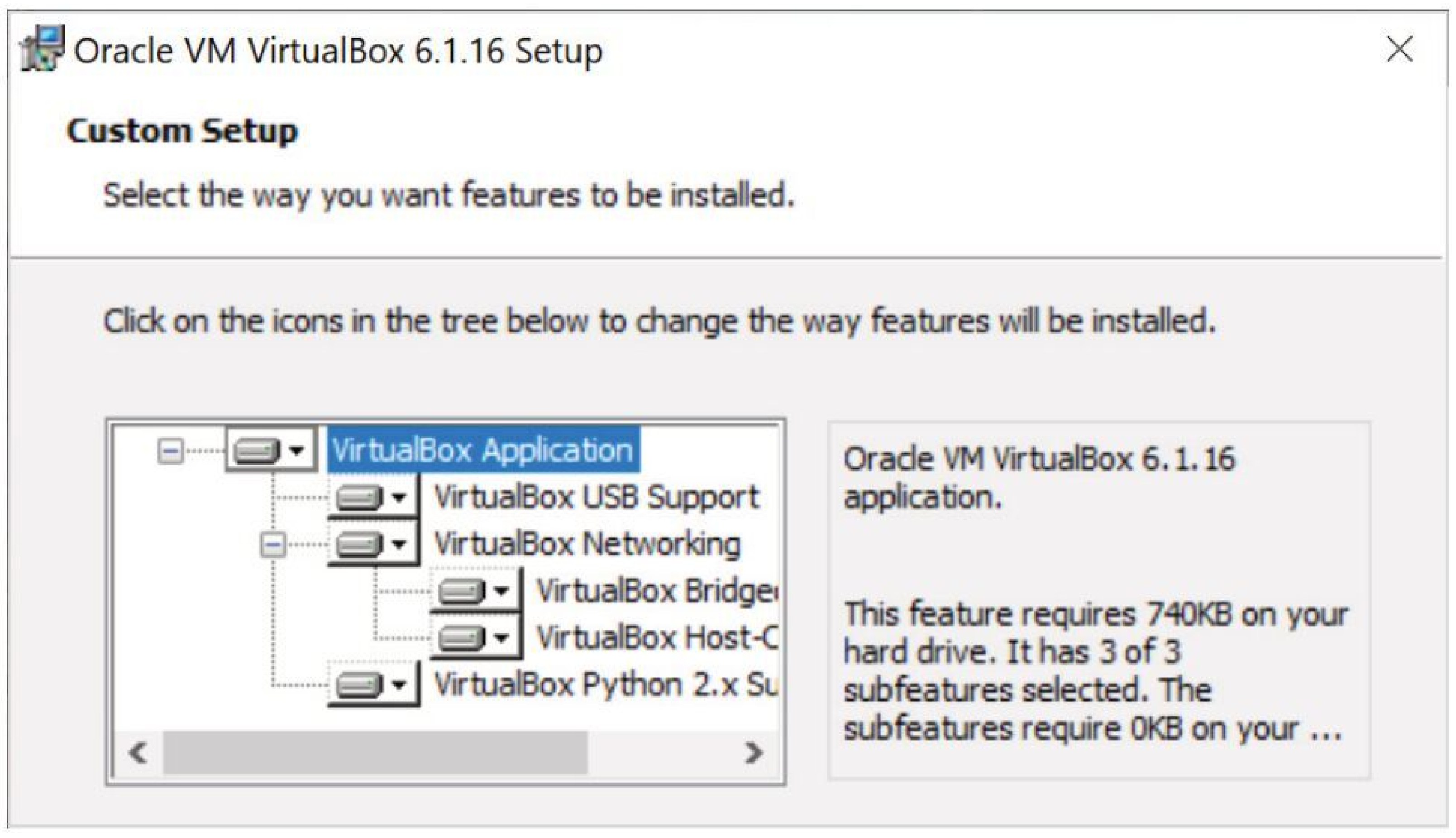
Oracle VM VirtualBox 6.1.16 Setup

**Welcome to the Oracle VM VirtualBox 6.1.16 Setup Wizard**

The Setup Wizard will install Oracle VM VirtualBox 6.1.16 on your computer. Click Next to continue or Cancel to exit the Setup Wizard.

Version 6.1.16

**STEP 6** The default installation location of VirtualBox should satisfy most users but if you have any special location requirements click on the 'Browse' button and change the install folder. Then, make sure that all the icons in the VirtualBox feature tree are selected, i.e. none of them have a red X next to them. Click Next to move on.



Oracle VM VirtualBox 6.1.16 Setup

**Custom Setup**

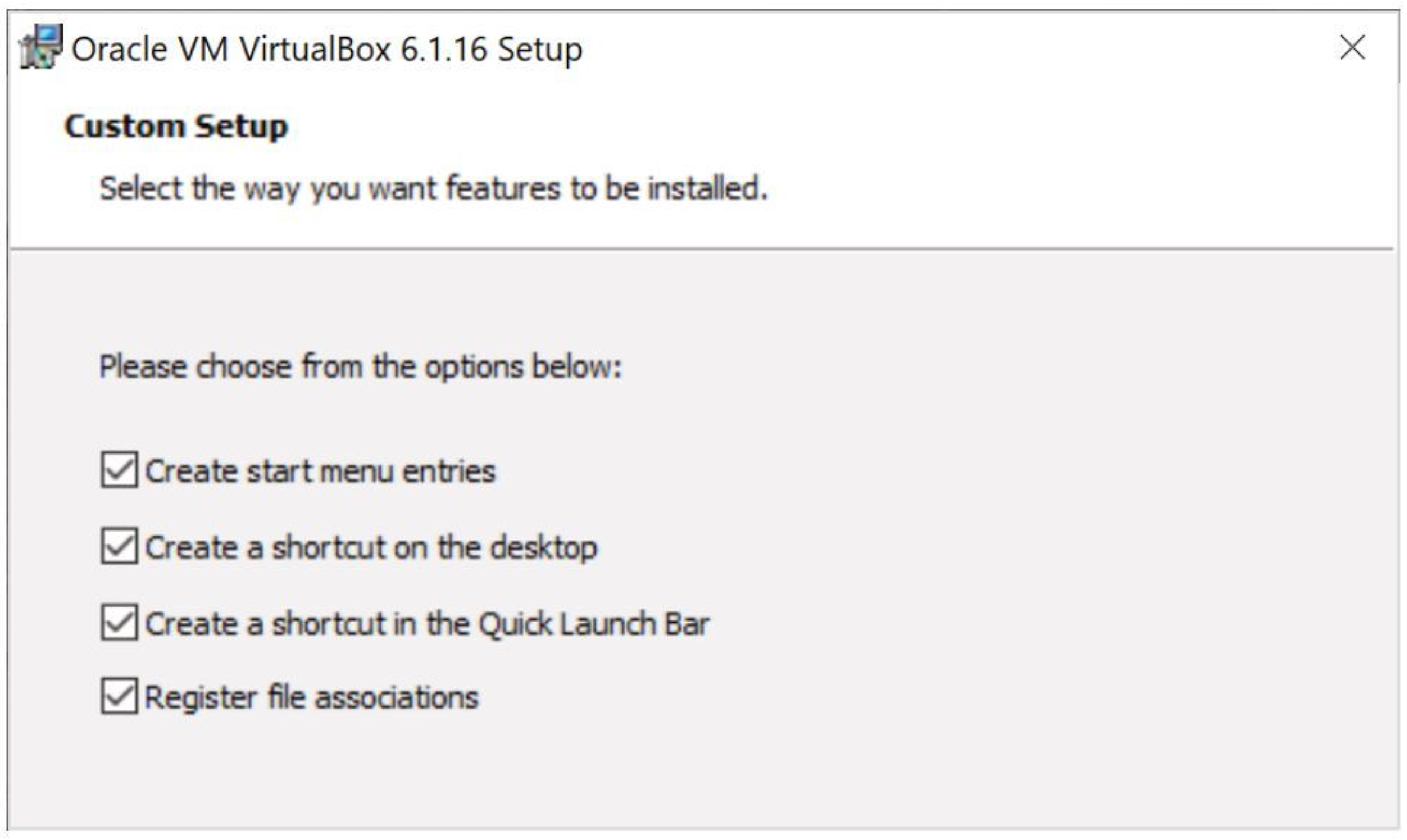
Select the way you want features to be installed.

Click on the icons in the tree below to change the way features will be installed.

Oracle VM VirtualBox 6.1.16 application.

This feature requires 740KB on your hard drive. It has 3 of 3 subfeatures selected. The subfeatures require 0KB on your …

**STEP 7** This section can be left alone to the defaults, should you wish. It simply makes life a little easier when dealing with VMs, especially when dealing with downloaded VMs, which you may encounter in the future. Again, clicking Next moves you on to the next stage.



Oracle VM VirtualBox 6.1.16 Setup

**Custom Setup**

Select the way you want features to be installed.

Please choose from the options below:

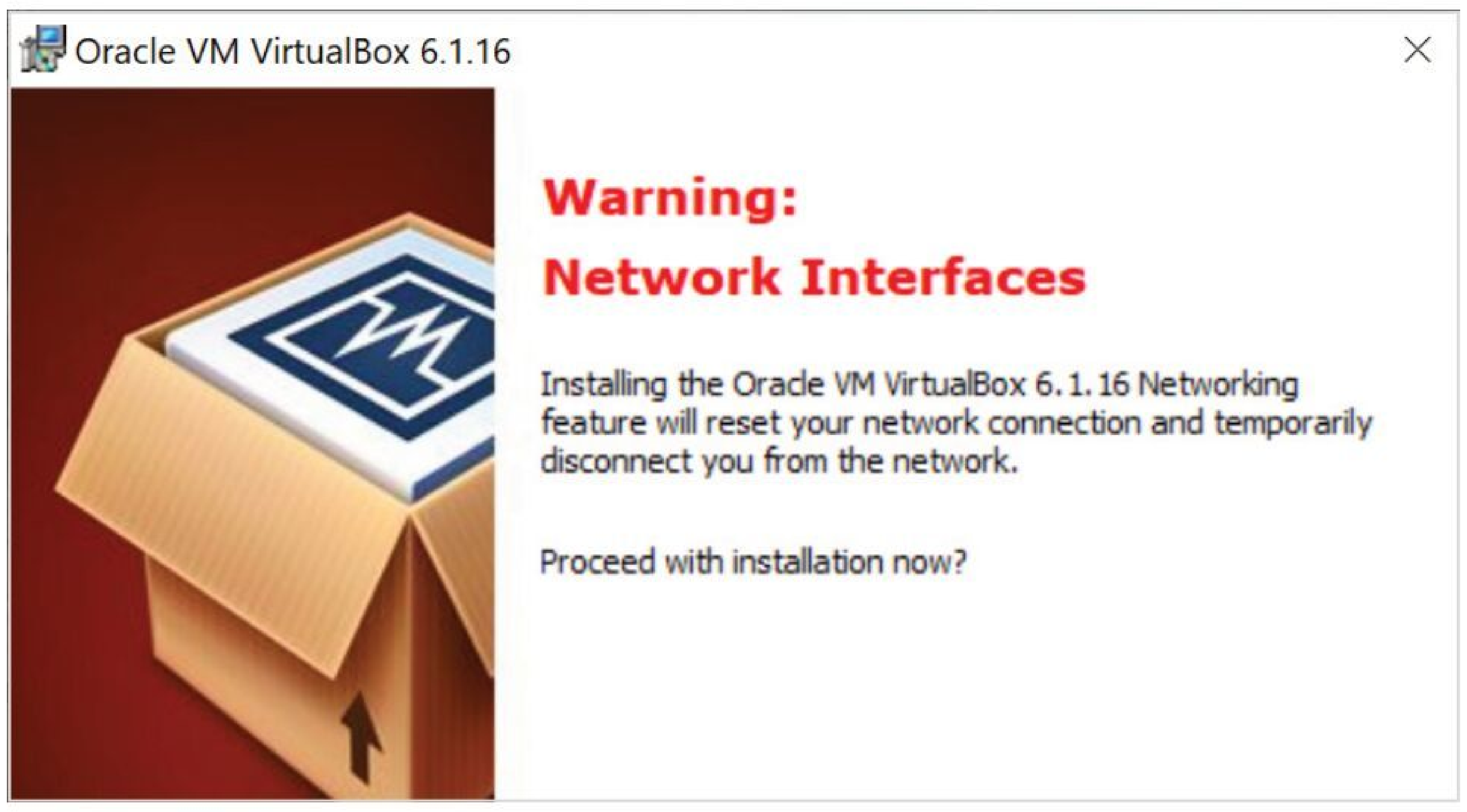
☑ Create start menu entries

☑ Create a shortcut on the desktop

☑ Create a shortcut in the Quick Launch Bar

☑ Register file associations

**STEP 8** When installing VirtualBox your network connection is disabled for a very brief period. This is due to VirtualBox creating a linked, virtual network connection so that any VM installed is able to access the Internet, and your home network resources, via the computer's already established network connection. Click Yes, then Install to begin the installation.



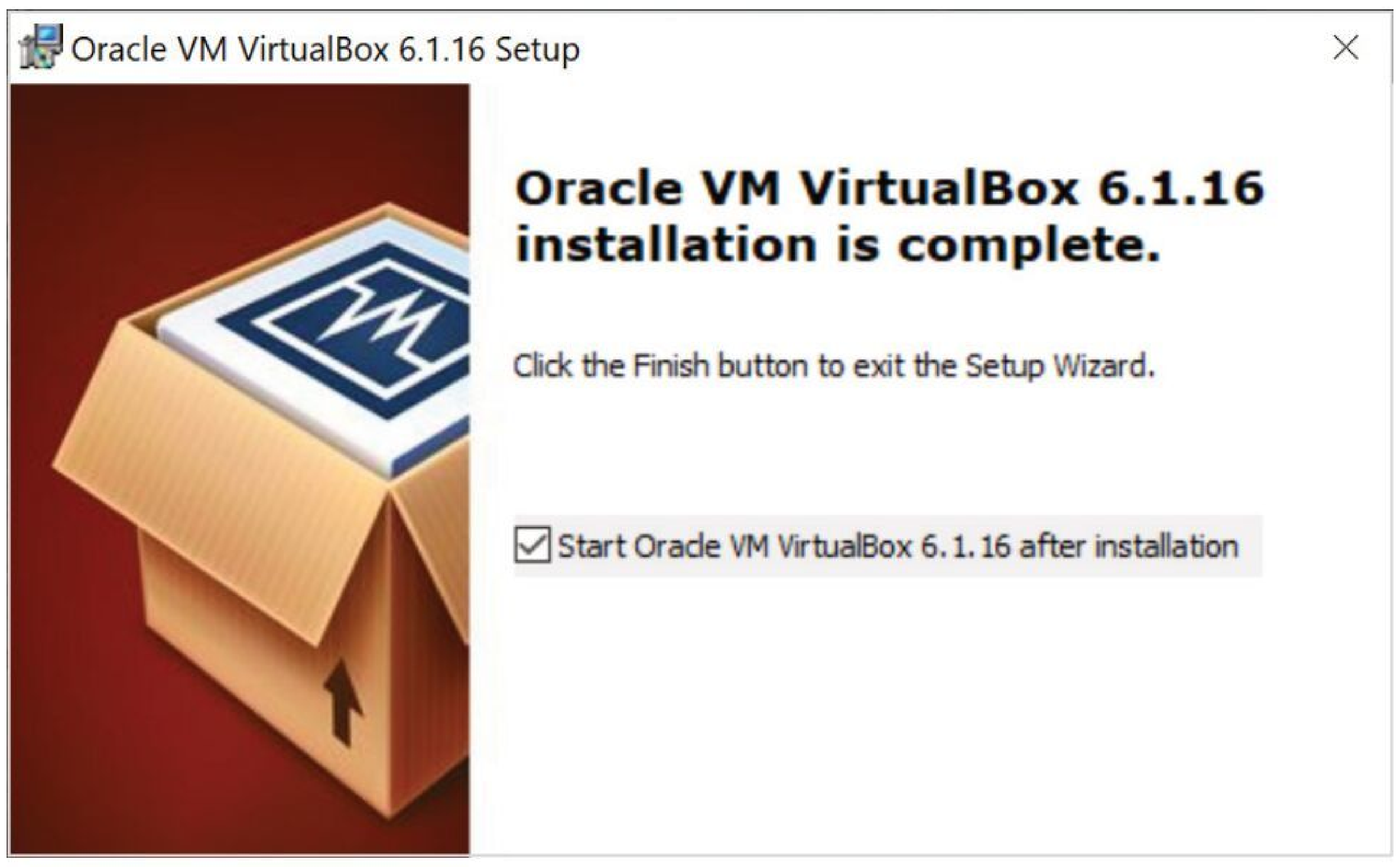
Oracle VM VirtualBox 6.1.16

**Warning:**
**Network Interfaces**

Installing the Oracle VM VirtualBox 6.1.16 Networking feature will reset your network connection and temporarily disconnect you from the network.

Proceed with installation now?

**STEP 9** You'll probably be asked by Windows to accept a security notification. Click Yes for this and you may encounter a dialogue box asking you to trust the installation from Oracle; again, click yes and accept the installation of the VirtualBox application. When it's complete, click finish to start VirtualBox.



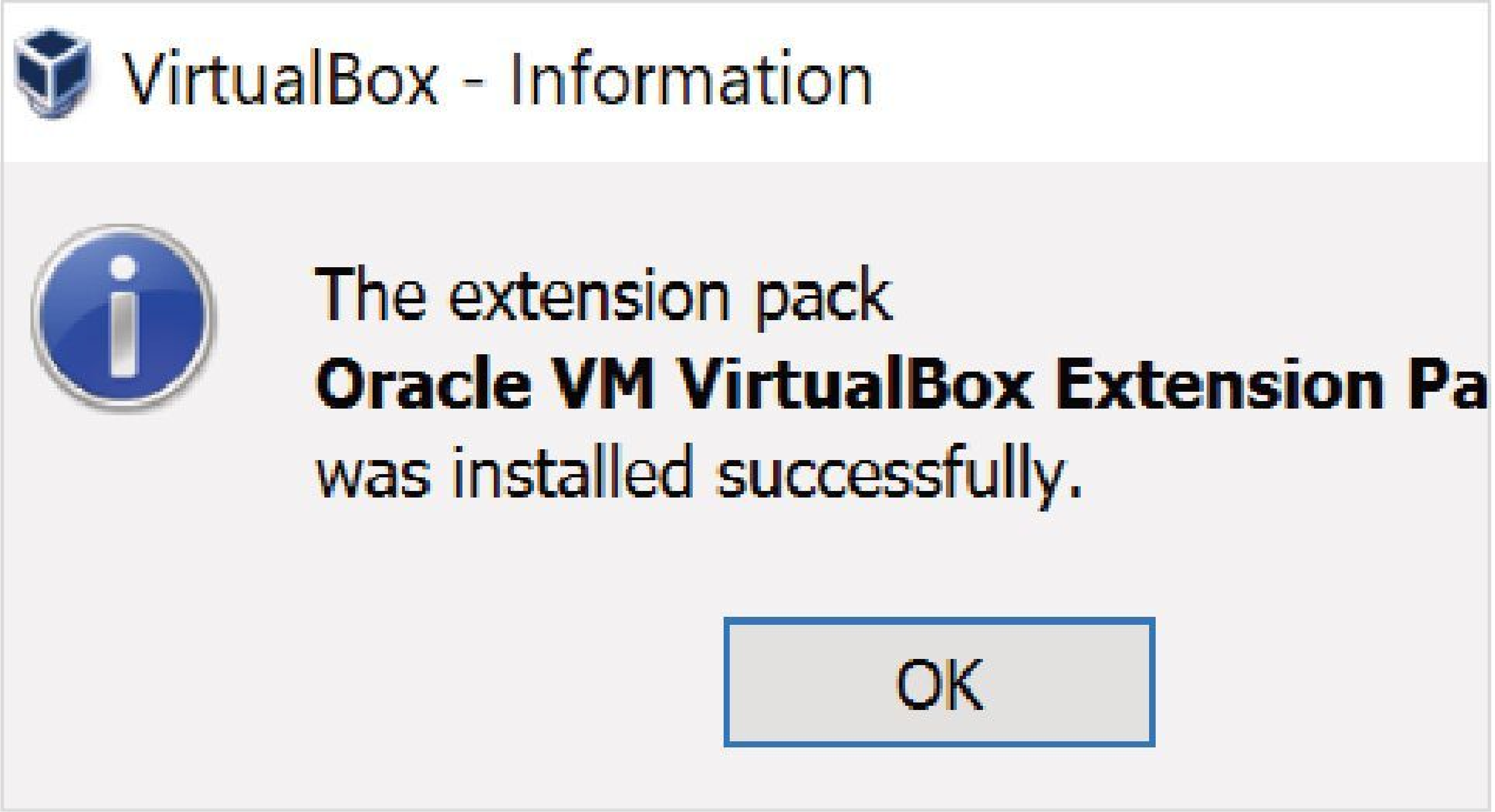
Oracle VM VirtualBox 6.1.16 Setup

**Oracle VM VirtualBox 6.1.16 installation is complete.**

Click the Finish button to exit the Setup Wizard.

☑ Start Oracle VM VirtualBox 6.1.16 after installation

**STEP 10** With VirtualBox up and running you can now install the VirtualBox Extension Pack. Locate the downloaded add-on and double-click. There may be a short pause while VirtualBox analyses the pack but you eventually receive a message to install it; obviously click Install to begin the process, scroll down the next screen to accept the agreement and click I Agree.



VirtualBox - Information

The extension pack
**Oracle VM VirtualBox Extension Pa**
was installed successfully.

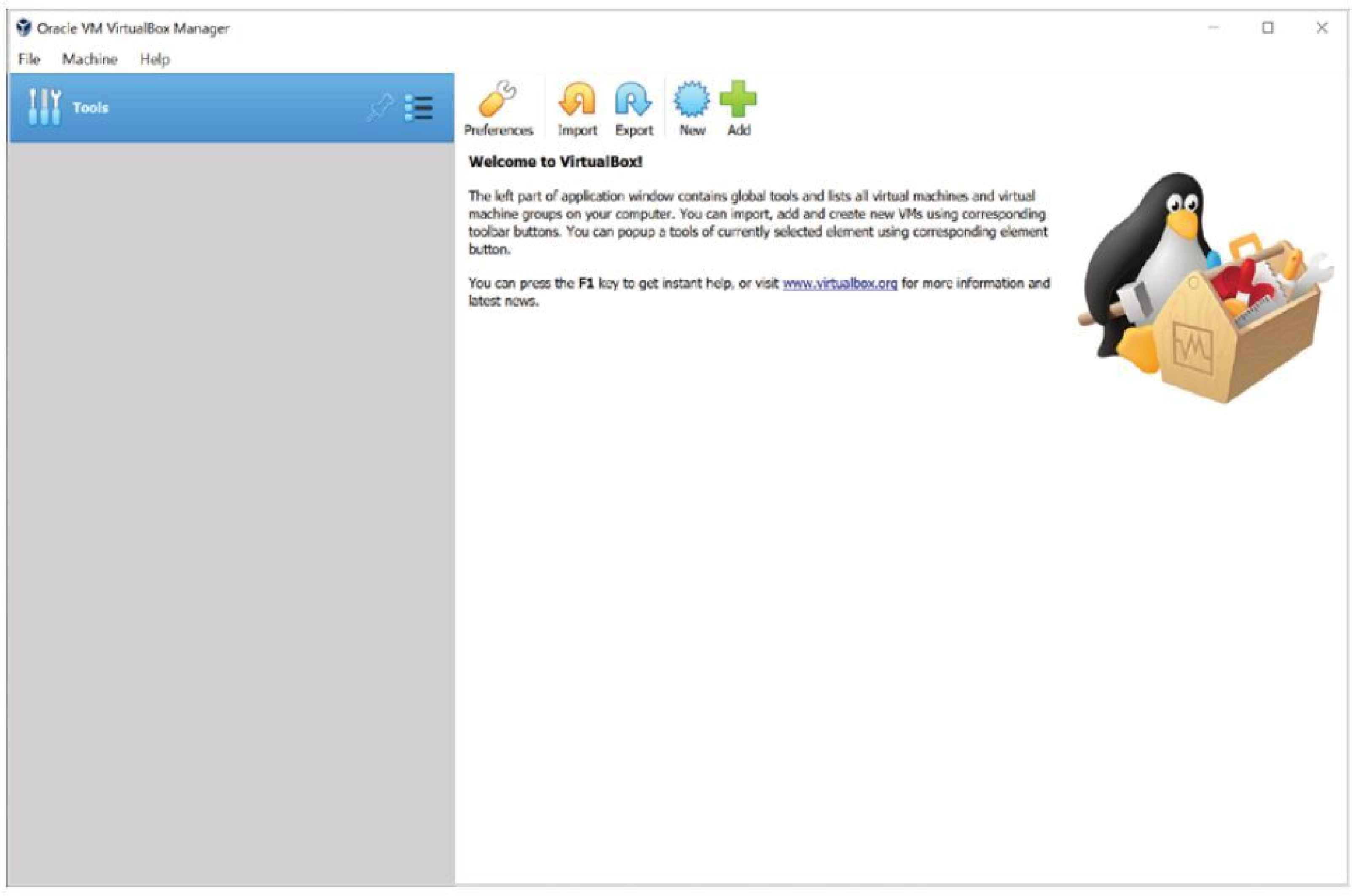
# Installing Linux in a Virtual Environment

With Oracle's VirtualBox now up and running, the next task is to create the Virtual Machine (VM) environment into which you will install Linux. This process won't affect your currently installed operating system, which is why a VM is a great choice.

## CREATING THE VM

**There are plenty of options to choose from when creating a VM. For now though, we'll setup a VM adequate to run the excellent Linux Mint, and perform well.**

**STEP 1** With VirtualBox open, click on the New icon in the top-middle of the right-hand panel of the app. This will open the new VM Wizard.

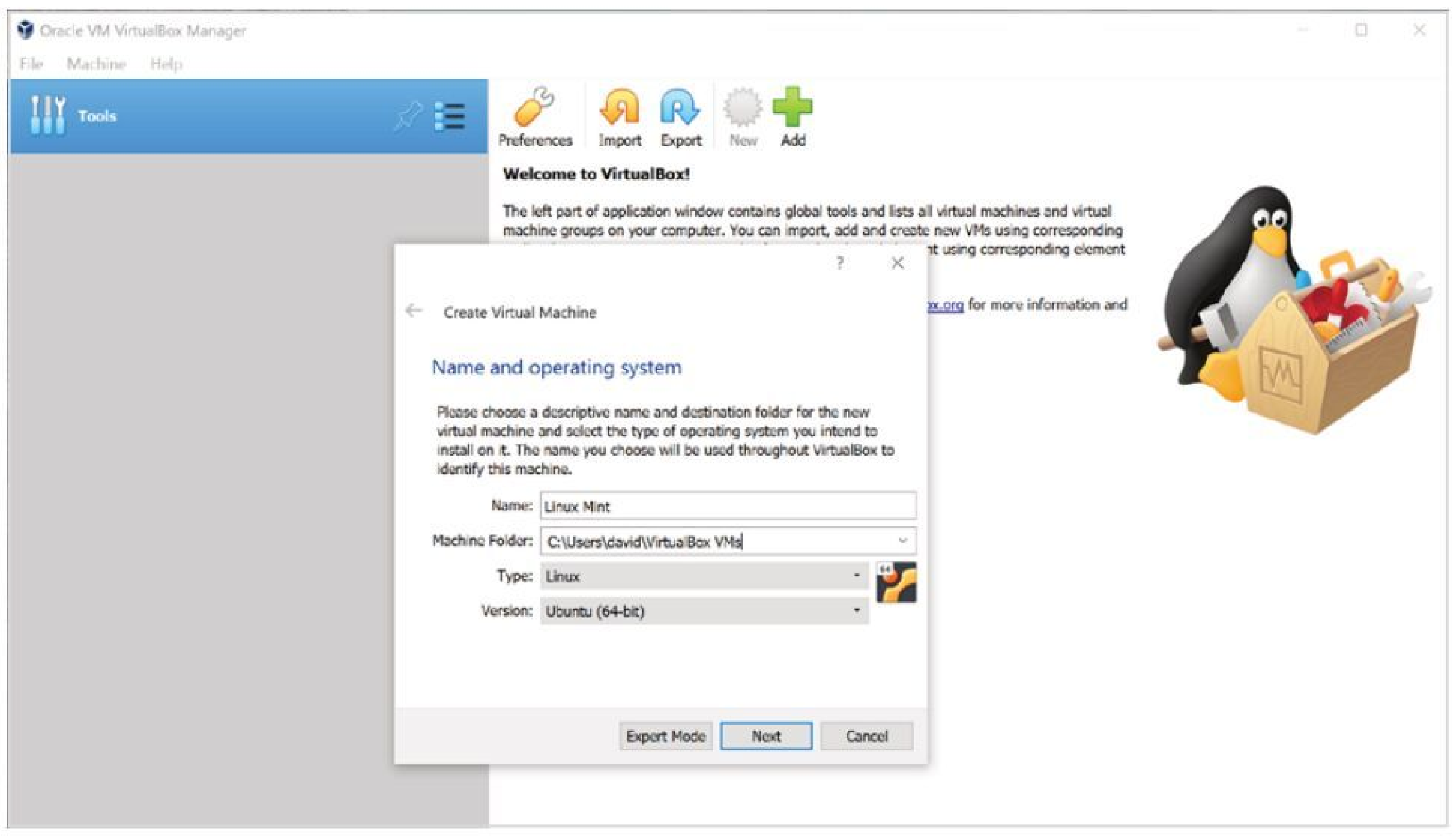

Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Preferences
Import
Export
New
Add

**Welcome to VirtualBox!**

The left part of application window contains global tools and lists all virtual machines and virtual machine groups on your computer. You can import, add and create new VMs using corresponding toolbar buttons. You can popup a tools of currently selected element using corresponding element button.

You can press the **F1** key to get instant help, or visit www.virtualbox.org for more information and latest news.

**STEP 2** In the box next to Name type Linux Mint, and VirtualBox should automatically choose Linux as the Type and Ubuntu (64-bit) as the Version, if not then use the drop-down boxes to select the correct settings (remember Mint mainstream is based on Ubuntu). Click Next when you're ready to proceed.

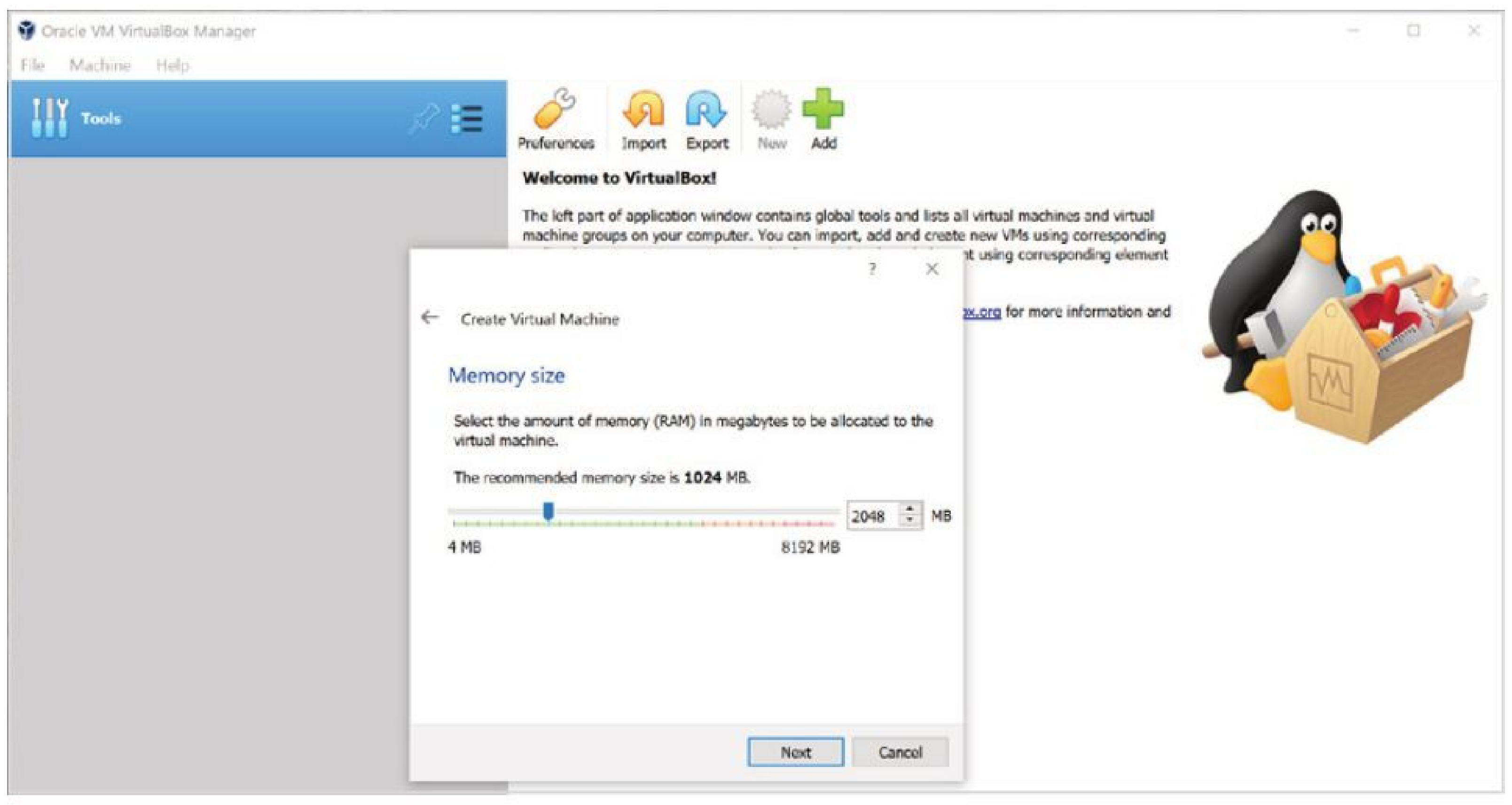

Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Preferences
Import
Export
New
Add
Create Virtual Machine
Export Mode
Next
Cancel

Name and operating system

Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.

Name: Linux Mint
Machine Folder: C:\Users\david\VirtualBox VMs
Type: Linux
Version: Ubuntu (64-bit)

**STEP 3** The next section will define the amount of system memory, or RAM, the VM has allocated. Remember this amount will be taken from the available memory installed in your computer, so don't give the VM too much. For example, we have 8GB of memory installed and we're giving 2GB (2048MB) to the VM. When you're ready, click Next to continue.


Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Preferences
Import
Export
New
Add
Create Virtual Machine
4 MB
8192 MB
Next
Cancel

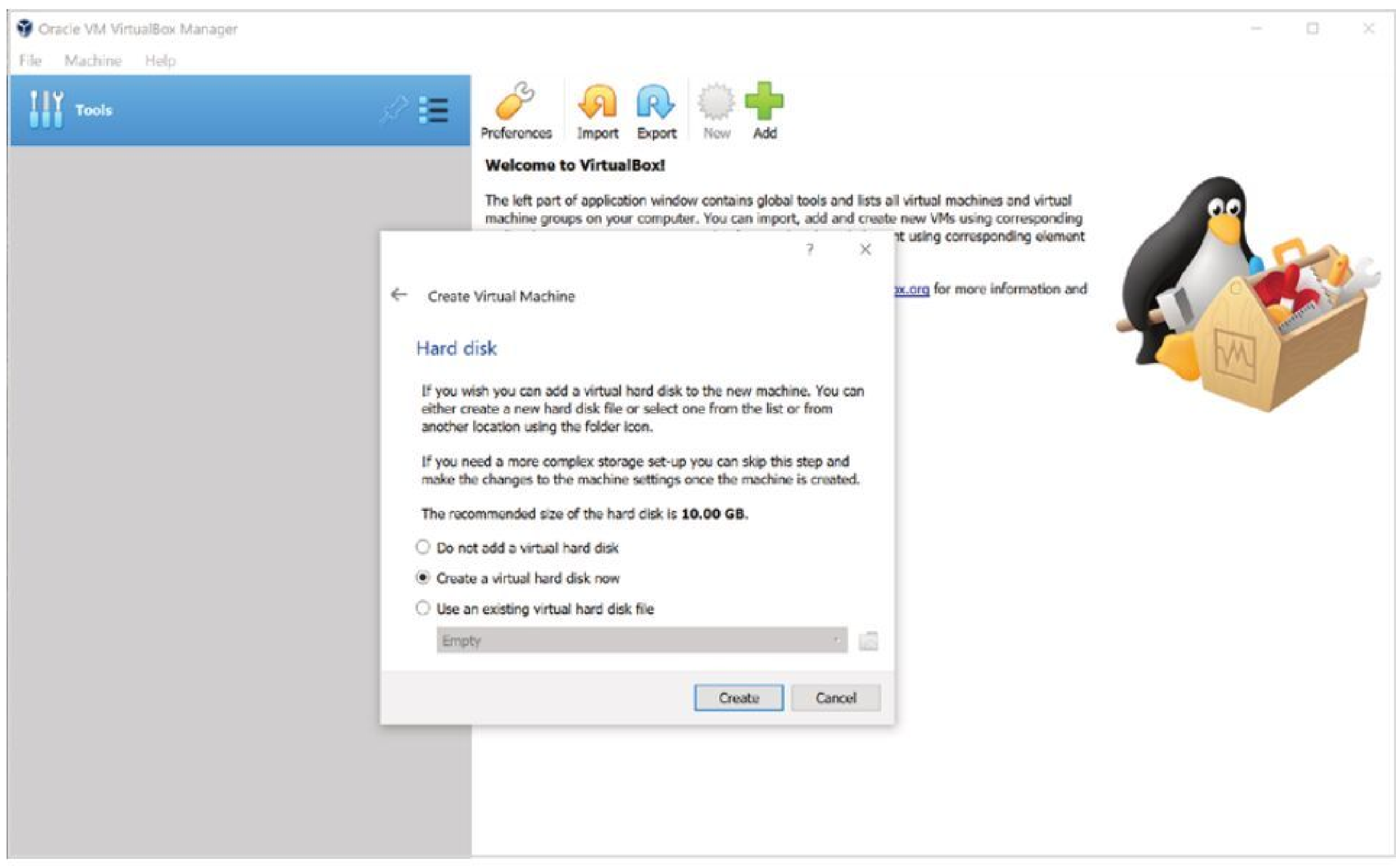
Memory size

Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine.

The recommended memory size is **1024** MB.

2048 MB

**STEP 4** This section is where you'll start to create the virtual hard disk that the VM will use to install Mint on to. The default option, 'Create a virtual hard disk now', is the one we're using. Click Create to move on.


Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Preferences
Import
Export
New
Add
Create Virtual Machine
Empty
Create
Cancel

Hard disk

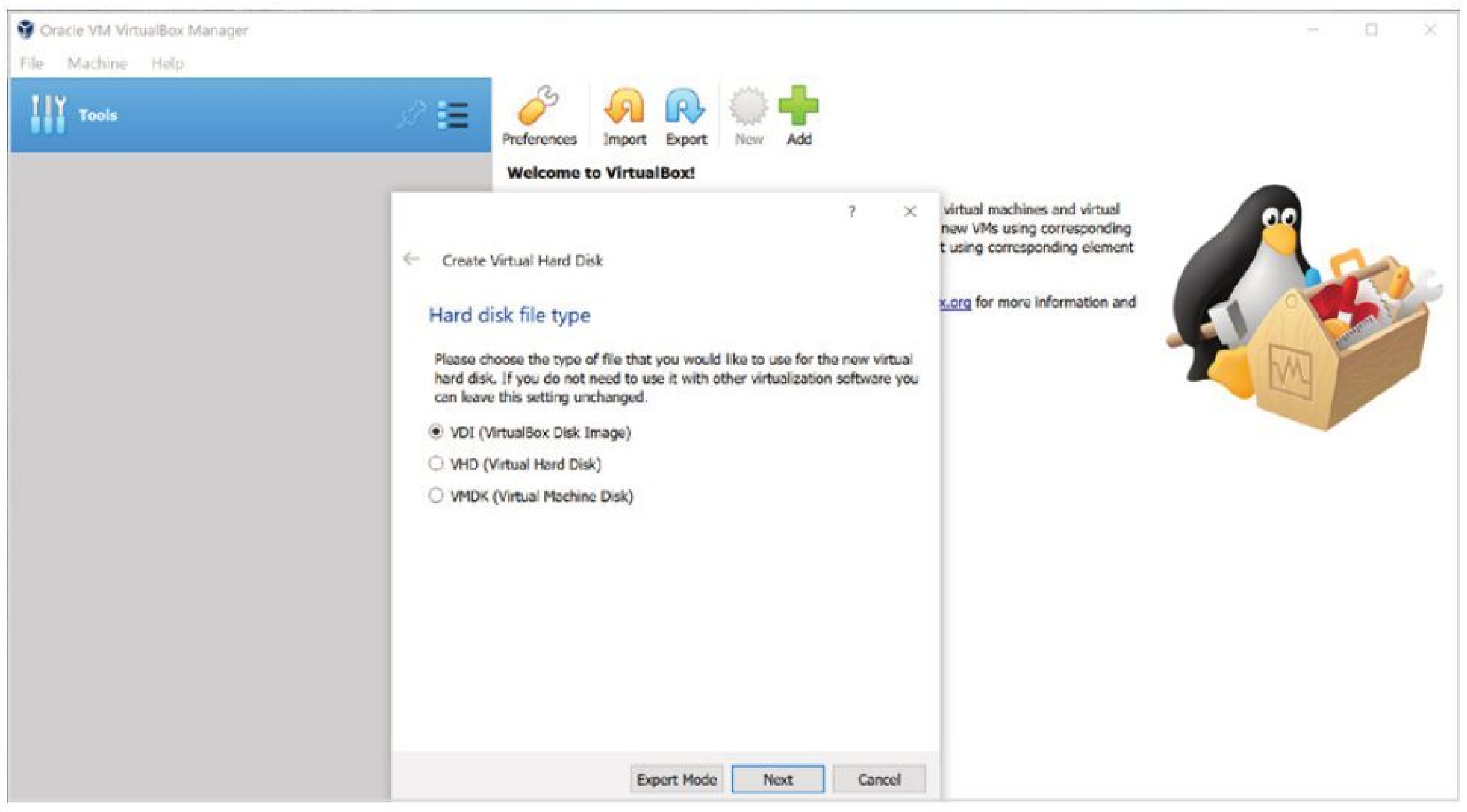
If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select one from the list or from another location using the folder icon.

If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.

The recommended size of the hard disk is **10.00 GB**.

○ Do not add a virtual hard disk
● Create a virtual hard disk now
○ Use an existing virtual hard disk file

**STEP 5** The pop-up window that appears after clicking Create is asking you what type of virtual hard disk you want to create. We're going to use the default VDI (VirtualBox Disk Image) in this case, as the others are often used to move VMs from one VM application to the next. Make sure VDI is selected, and click Next.


Oracle VM VirtualBox Manager
File Machine Help
Tools
Preferences
Import
Export
New
Add

**Welcome to VirtualBox!**

Create Virtual Hard Disk

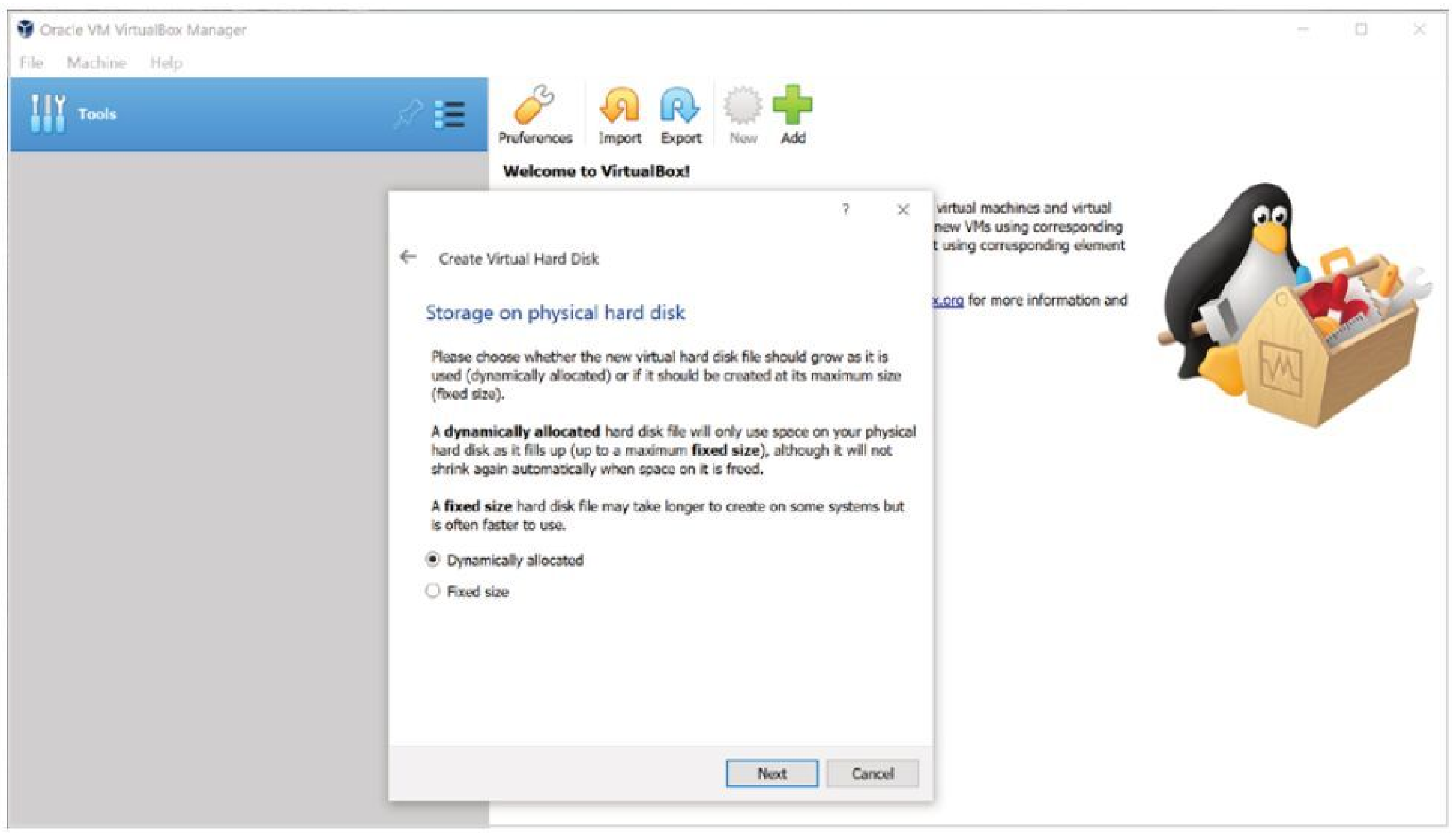
Hard disk file type

Please choose the type of file that you would like to use for the new virtual hard disk. If you do not need to use it with other virtualization software you can leave this setting unchanged.

- ● VDI (VirtualBox Disk Image)
- ○ VHD (Virtual Hard Disk)
- ○ VMDK (Virtual Machine Disk)

Expert Mode
Next
Cancel

**STEP 6** The question of whether to opt for Dynamically or Fixed sized virtual hard disks may come across as being somewhat confusing to the newcomer. Basically, a Dynamically Allocated virtual hard disk is a more flexible storage management option. It won't take up much space within your physical hard disk to begin with either. Ensure Dynamically Allocated is selected, and click Next.


Oracle VM VirtualBox Manager
File Machine Help
Tools
Preferences
Import
Export
New
Add

**Welcome to VirtualBox!**

Create Virtual Hard Disk

Storage on physical hard disk

Please choose whether the new virtual hard disk file should grow as it is used (dynamically allocated) or if it should be created at its maximum size (fixed size).

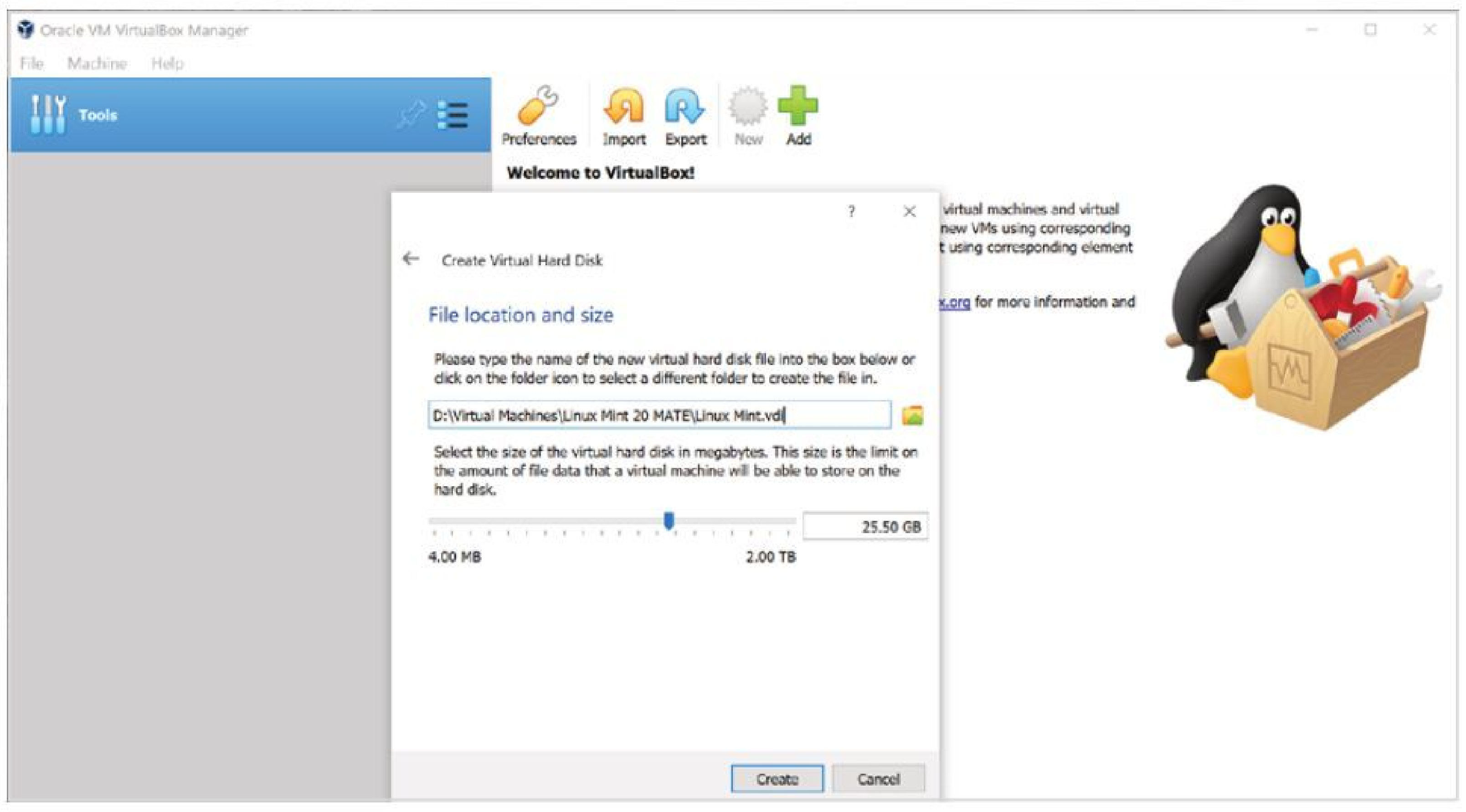
A **dynamically allocated** hard disk file will only use space on your physical hard disk as it fills up (up to a maximum **fixed size**), although it will not shrink again automatically when space on it is freed.

A **fixed size** hard disk file may take longer to create on some systems but is often faster to use.

- ● Dynamically allocated
- ○ Fixed size

Next
Cancel

**STEP 7** The virtual hard disk will be a single folder, up to the size you state in this section. Ensure the location of the virtual hard disk, on your computer, has enough free space available. For example, we've used a bigger storage option on our D:\ drive, named it Linux Mint, and allocated 25.50GB of space to the virtual hard disk.


Oracle VM VirtualBox Manager
File Machine Help
Tools
Preferences
Import
Export
New
Add

**Welcome to VirtualBox!**

Create Virtual Hard Disk

File location and size

Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in.

D:\Virtual Machines\Linux Mint 20 MATE\Linux Mint.vdi

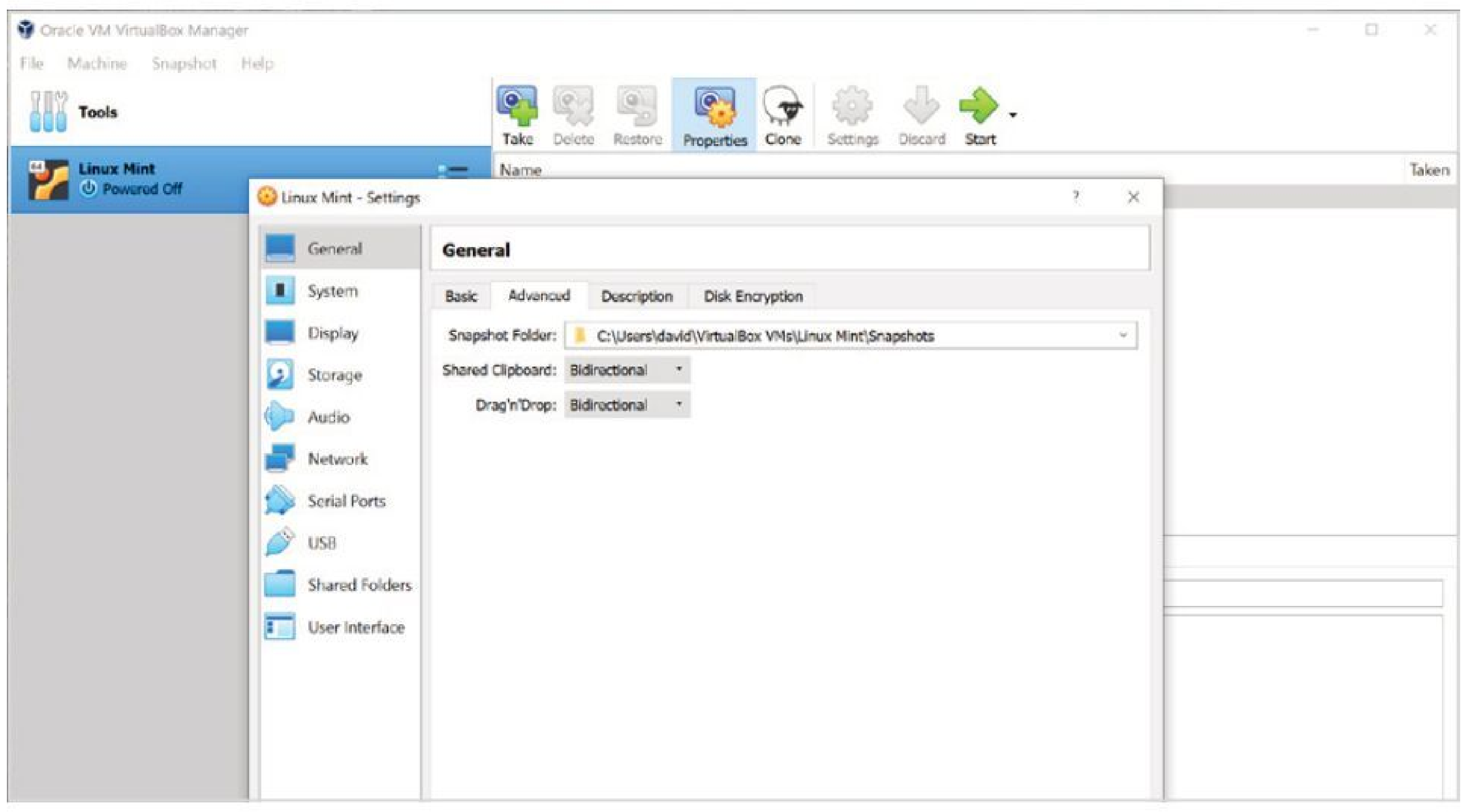
Select the size of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk.

25.50 GB

4.00 MB 2.00 TB

Create
Cancel

**STEP 8** After clicking Create the initial setup of the VM is complete; you should now be looking at the newly created VM within the VirtualBox application. Before you begin though, click the Settings button from the top of the right-hand panel, and within the General section click the Advanced tab. Using the pull-down menus, choose 'Bidirectional' for both Shared Clipboard and Drag'n'Drop.


Oracle VM VirtualBox Manager
File Machine Snapshot Help
Tools
Take
Delete
Restore
Properties
Clone
Settings
Discard
Start
Linux Mint
Powered Off
Name
Taken
Linux Mint - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface

**General**

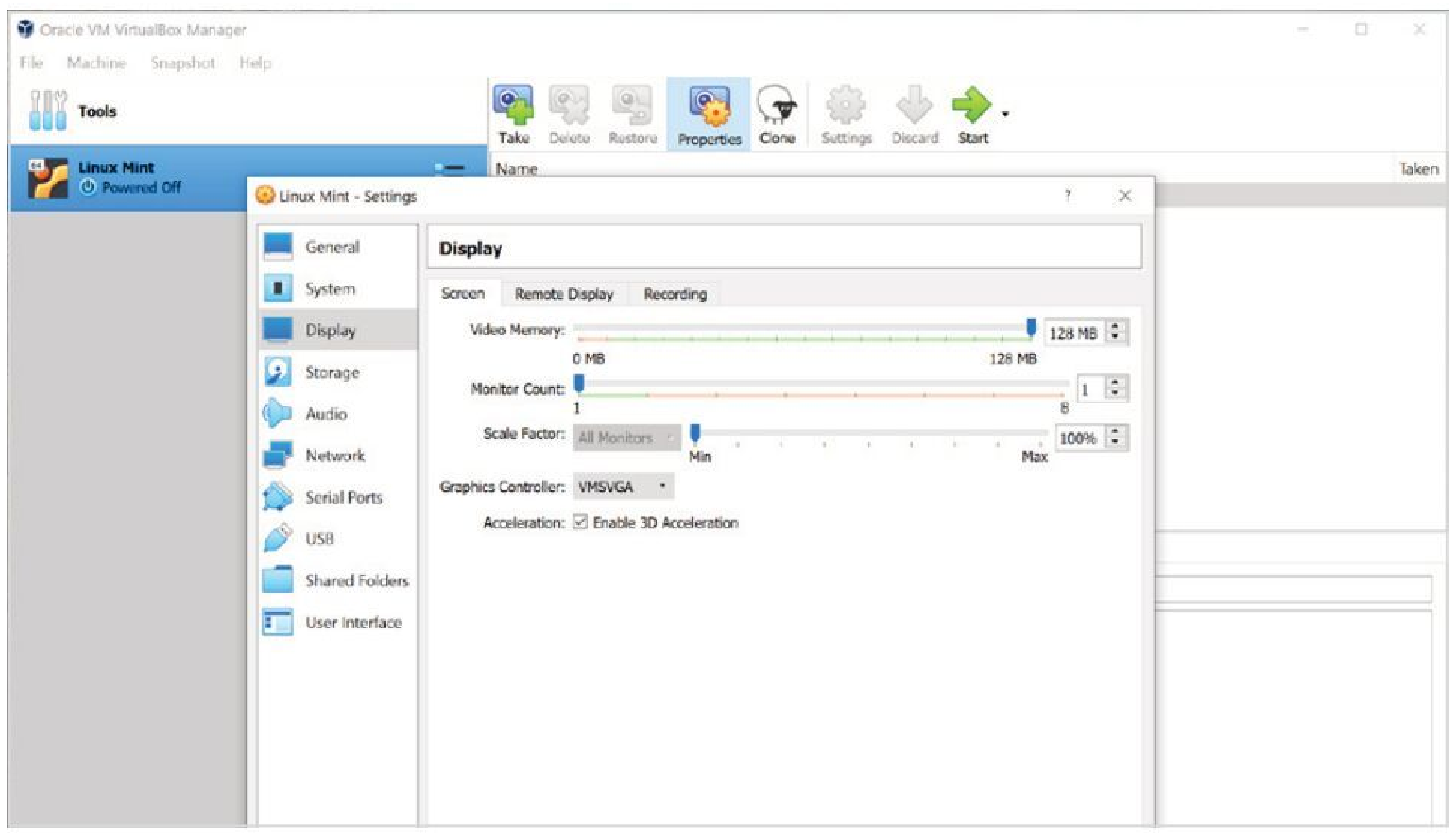
Basic | Advanced | Description | Disk Encryption

Snapshot Folder: C:\Users\david\VirtualBox VMs\Linux Mint\Snapshots

Shared Clipboard: Bidirectional

Drag'n'Drop: Bidirectional

**STEP 9** Follow that by clicking on the System section, then the Processor tab. Depending on your CPU allocate as many cores as you can without detriment to your host system; we've opted for two CPUs. Now click on the Display section, slide the Video Memory up to the maximum, and tick 'Enable 3D Acceleration'. Click OK to commit the new settings.


Oracle VM VirtualBox Manager
File Machine Snapshot Help
Tools
Take
Delete
Restore
Properties
Clone
Settings
Discard
Start
Linux Mint
Powered Off
Name
Taken
Linux Mint - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface

**Display**

Screen | Remote Display | Recording

Video Memory: 128 MB (0 MB – 128 MB)

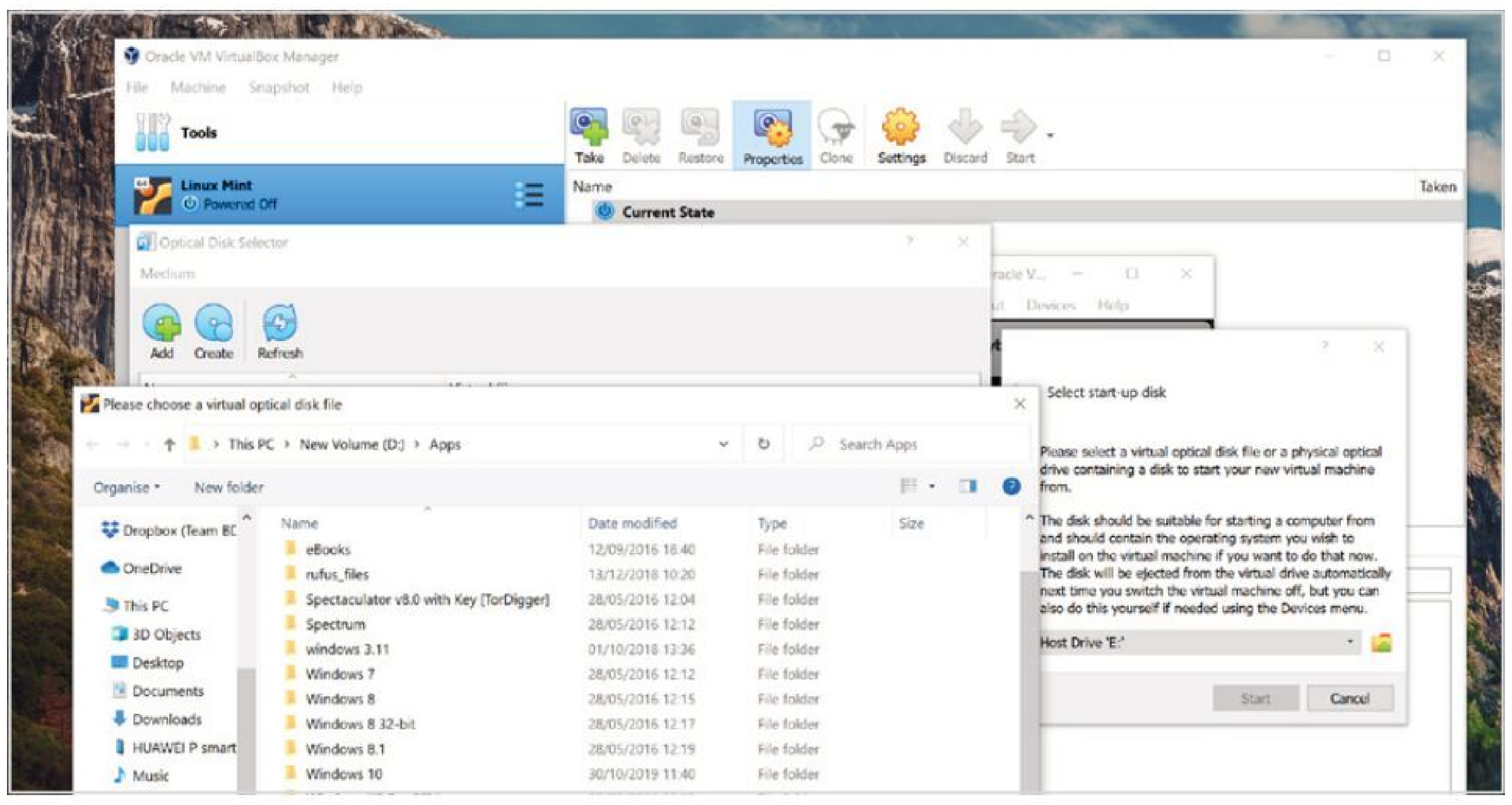
Monitor Count: 1 (1 – 8)

Scale Factor: All Monitors 100% (Min – Max)

Graphics Controller: VMSVGA

Acceleration: ☑ Enable 3D Acceleration

**STEP 10** Click on the Start button and use the explorer button in the 'Select Start-up Disk' window; the explorer button is a folder with a green arrow. Click Add in the new pop-up window, to locate the downloaded ISO of Mint; and click Open to select the ISO. Now click the Start button to boot the VM with the Linux Mint Live Environment. You can now install Linux as per the standard PC installation requirements.


Oracle VM VirtualBox Manager
File Machine Snapshot Help
Tools
Take
Delete
Restore
Properties
Clone
Settings
Discard
Start
Linux Mint
Powered Off
Name
Taken
Current State
Optical Disk Selector
Medium
Add
Create
Refresh
Organise
New folder
Search Apps
Dropbox (Team BD
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
HUAWEI P smart
Music
Devices
Help

Please choose a virtual optical disk file

This PC › New Volume (D:) › Apps

| Name | Date modified | Type | Size |
|---|---|---|---|
| eBooks | 12/09/2016 18:40 | File folder | |
| rufus_files | 13/12/2018 10:20 | File folder | |
| Spectaculator v8.0 with Key [TorDigger] | 28/05/2016 12:04 | File folder | |
| Spectrum | 28/05/2016 12:12 | File folder | |
| windows 3.11 | 01/10/2018 13:36 | File folder | |
| Windows 7 | 28/05/2016 12:12 | File folder | |
| Windows 8 | 28/05/2016 12:15 | File folder | |
| Windows 8 32-bit | 28/05/2016 12:17 | File folder | |
| Windows 8.1 | 28/05/2016 12:19 | File folder | |
| Windows 10 | 30/10/2019 11:40 | File folder | |

Select start-up disk

Please select a virtual optical disk file or a physical optical drive containing a disk to start your new virtual machine from.

The disk should be suitable for starting a computer from and should contain the operating system you wish to install on the virtual machine if you want to do that now. The disk will be ejected from the virtual drive automatically next time you switch the virtual machine off, but you can also do this yourself if needed using the Devices menu.

Host Drive 'E:'

Start
Cancel

“Anyone can build a fast processor. The trick is to build a fast system.”

*– Seymour Cray (Electrical Engineer, and designer/founder of Cray Supercomputers)*

# Getting to Know Linux

We've used Linux Mint as a guideline here, as it's an easy to use distro and perfect for former Windows users. It's also one of the most developed and well documented Linux distros as well as having some fantastic configuration options.

In this section, we introduce the Linux Mint Cinnamon Menu and Desktop Environment, how it works and what you can do to customise it. Want to create another user or even discover how to become anonymous online? Then read on.

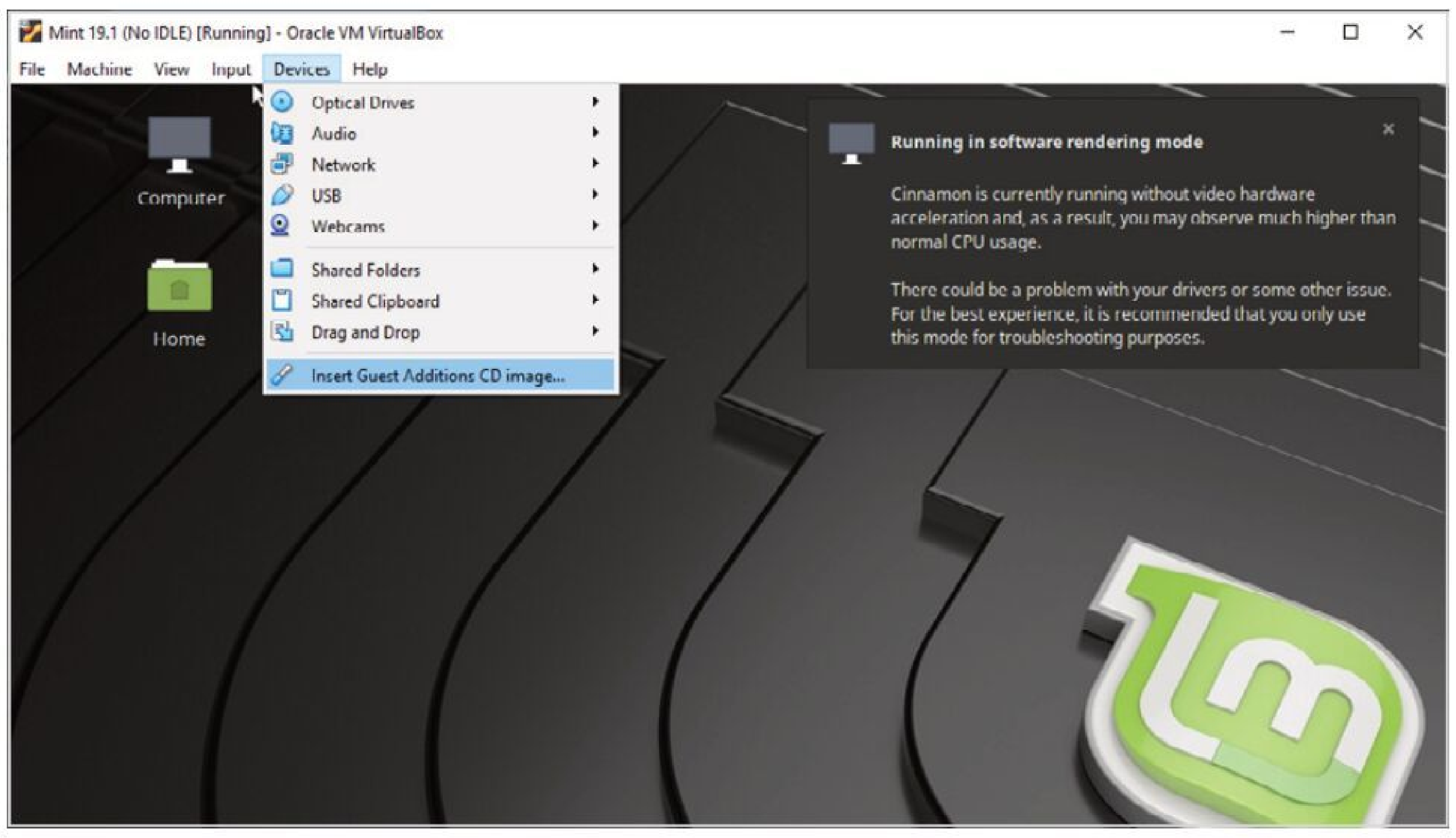
# Introduction to the Cinnamon Menu

Now that you have Linux installed it's time to have a good look around. First though, if you're using Virtualbox you'll have a notification regarding Software Rendering; here's how to fix it.

## CINNAMON VIRTUALBOX FIX

**You've already looked at some list functions, using .insert, .remove, and .pop but there are also functions that can be applied to strings.**

**STEP 1** Before we begin, we're assuming you're having this issue within Virtualbox. The Software Rendering message appears in the top right of the desktop. To fix this, click on Devices in the Virtualbox window, followed by Insert Guest Additions CD Image.

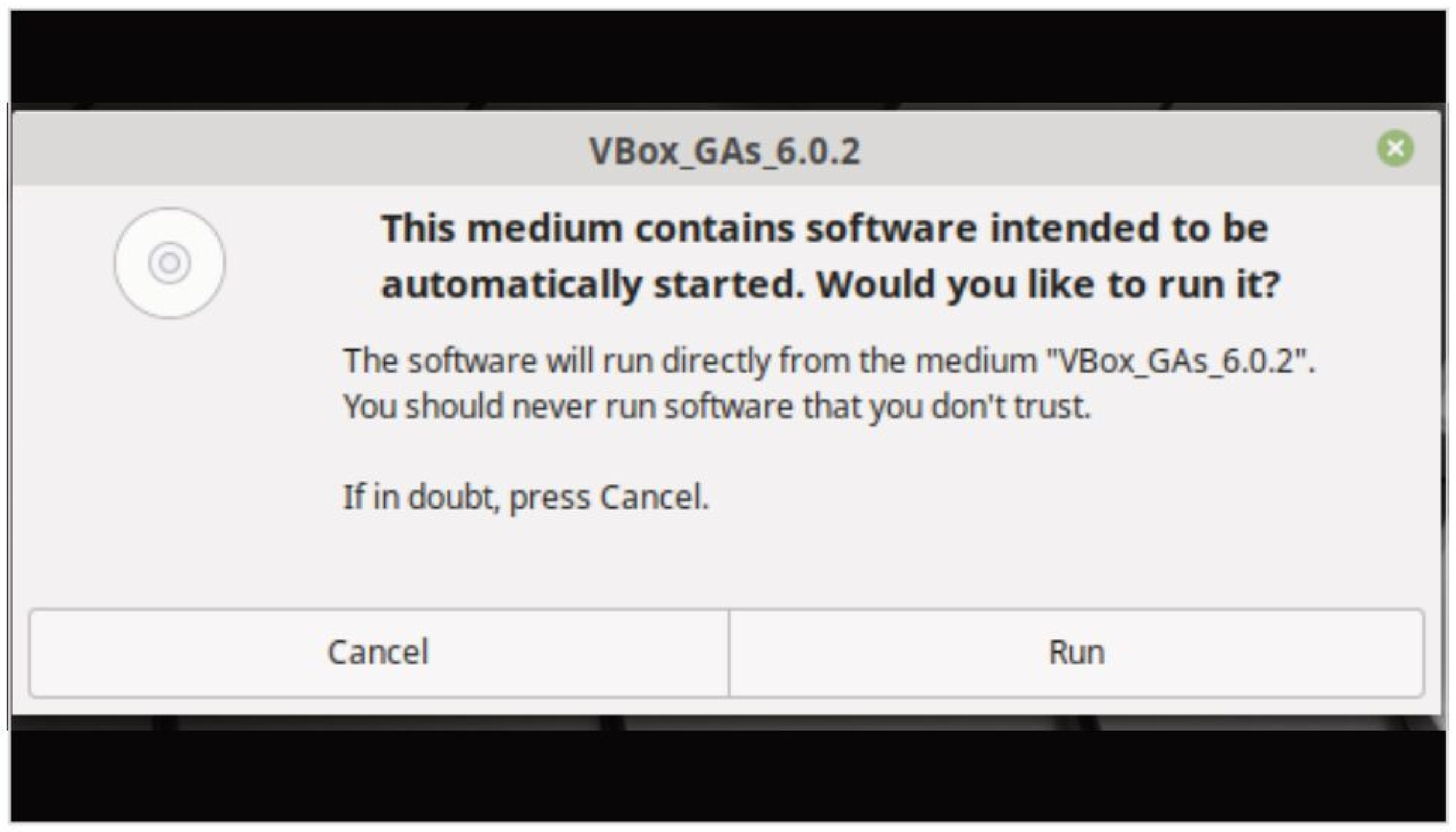

Mint 19.1 (No IDLE) [Running] - Oracle VM VirtualBox
File
Machine
View
Input
Devices
Help
Optical Drives
Audio
Network
USB
Webcams
Shared Folders
Shared Clipboard
Drag and Drop
Insert Guest Additions CD image...
Computer
Home

**Running in software rendering mode**

Cinnamon is currently running without video hardware acceleration and, as a result, you may observe much higher than normal CPU usage.

There could be a problem with your drivers or some other issue. For the best experience, it is recommended that you only use this mode for troubleshooting purposes.

**STEP 2** The Guest Additions CD contains drivers for Virtualbox, including the virtual video hardware. When it's loaded in, you get a 'software needs running' notification box with two options, Cancel and Run. Click the Run button and enter your Linux user password.

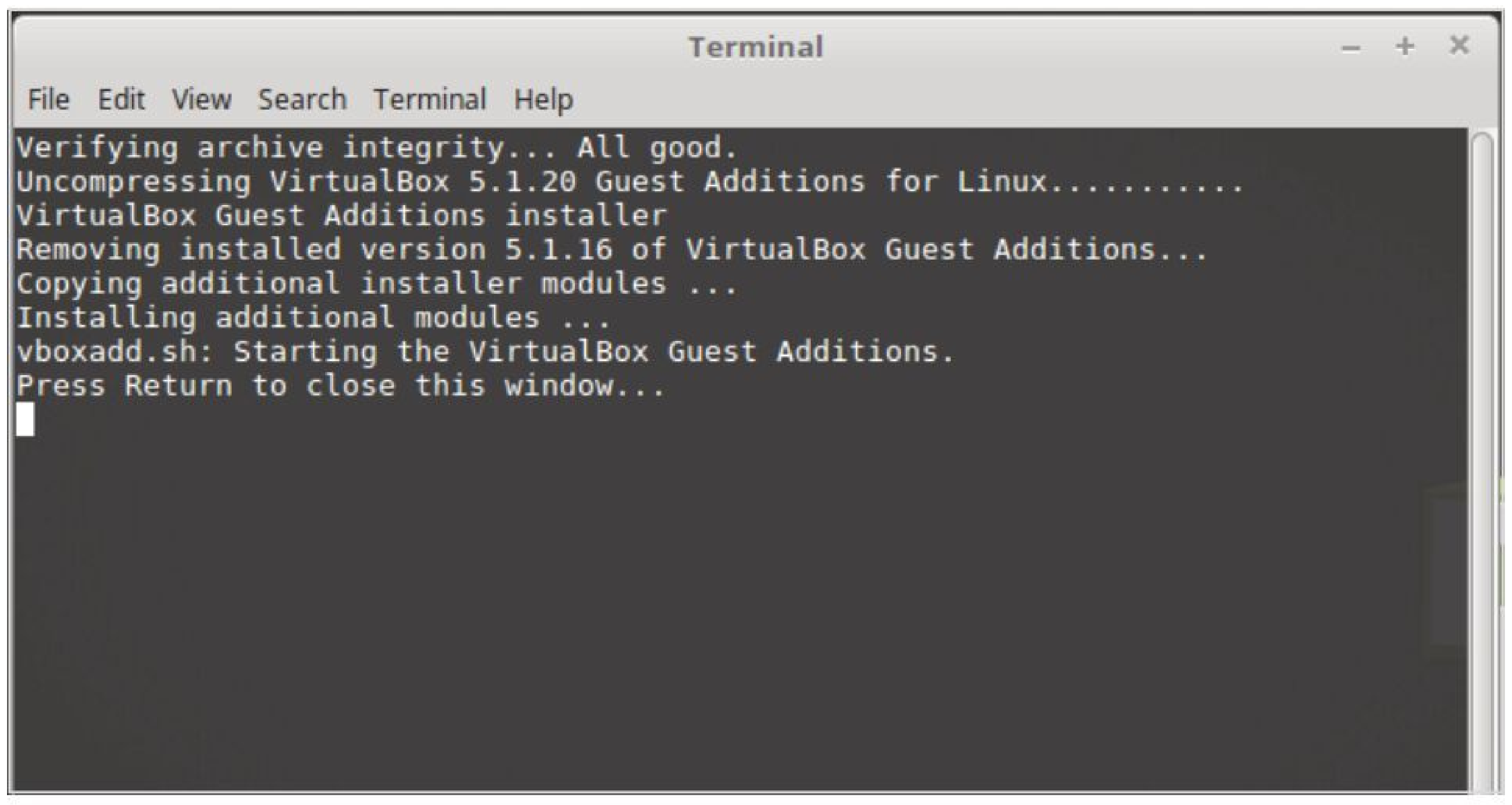

VBox_GAs_6.0.2
Cancel
Run

**This medium contains software intended to be automatically started. Would you like to run it?**

The software will run directly from the medium "VBox_GAs_6.0.2". You should never run software that you don't trust.

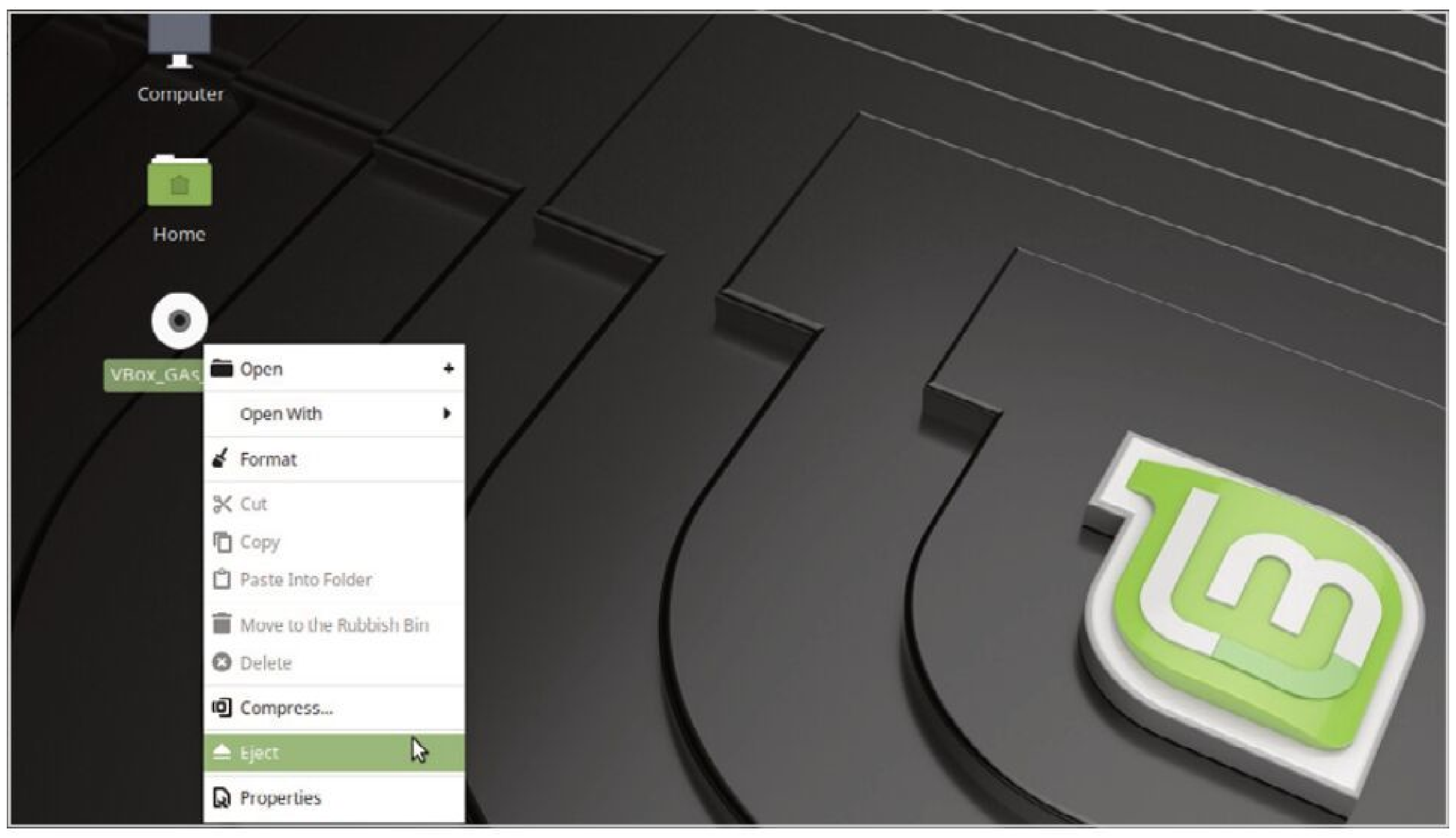
If in doubt, press Cancel.

**STEP 3** After a moment or two you're automatically dropped into a command line view, called the Terminal in Linux. This details the installation of the new VirtualBox drivers, removing any old drivers it has detected, and installing the latest versions. It won't take long and when it's done you will be asked to hit Return to exit the Terminal.


Terminal
File
Edit
View
Search
Terminal
Help

```
Verifying archive integrity... All good.
Uncompressing VirtualBox 5.1.20 Guest Additions for Linux..........
VirtualBox Guest Additions installer
Removing installed version 5.1.16 of VirtualBox Guest Additions...
Copying additional installer modules ...
Installing additional modules ...
vboxadd.sh: Starting the VirtualBox Guest Additions.
Press Return to close this window...
```

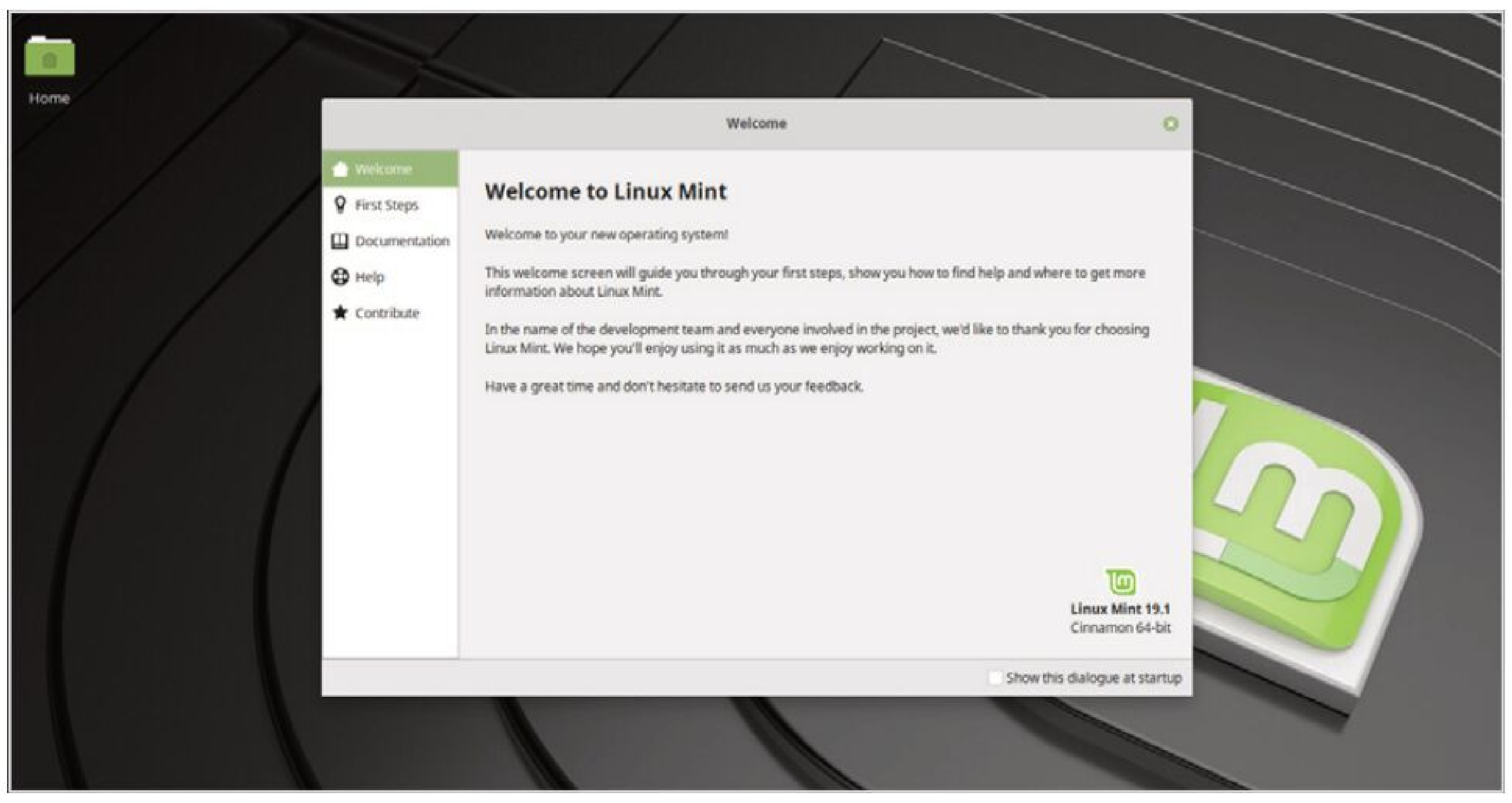
**STEP 4** The Virtualbox Additions CD icon is on the desktop, so right-click it and then scroll down the menu to click Eject. You can now restart Linux Mint by clicking the Menu, the bottom icon in the strip to the left, then the Restart button. This reboots Mint and the problem is fixed.


Computer
Home
VBox_GAs
Open
Open With
Format
Cut
Copy
Paste Into Folder
Move to the Rubbish Bin
Delete
Compress...
Eject
Properties

## CINNAMON ON THE MENU

**Now the Software Rendering issue for Virtalbox users is out of the way, let's take a look at the Mint Menu and how it all works. Remember, this is just for Mint Cinnamon, other distros look and behave differently.**

**STEP 1** First off, you may have already noticed the Welcome Screen that pops up when you login to Linux Mint. Take a moment to browse through the options, read the First Steps option and so on. When you're done, click the X in the top right corner of the window to close it.


Home
Welcome
Welcome
First Steps
Documentation
Help
Contribute
Show this dialogue at startup

Welcome to Linux Mint

Welcome to your new operating system!

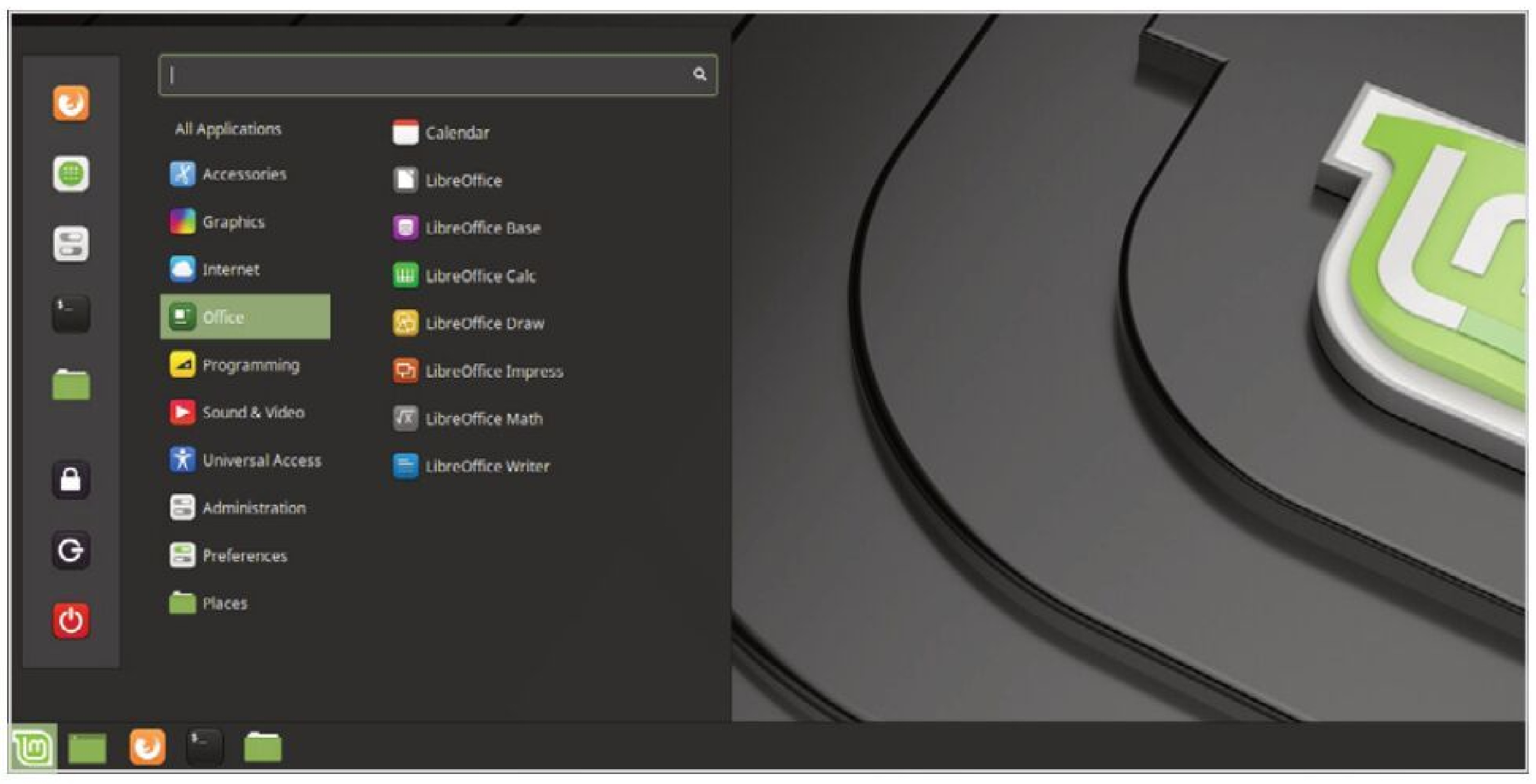
This welcome screen will guide you through your first steps, show you how to find help and where to get more information about Linux Mint.

In the name of the development team and everyone involved in the project, we'd like to thank you for choosing Linux Mint. We hope you'll enjoy using it as much as we enjoy working on it.

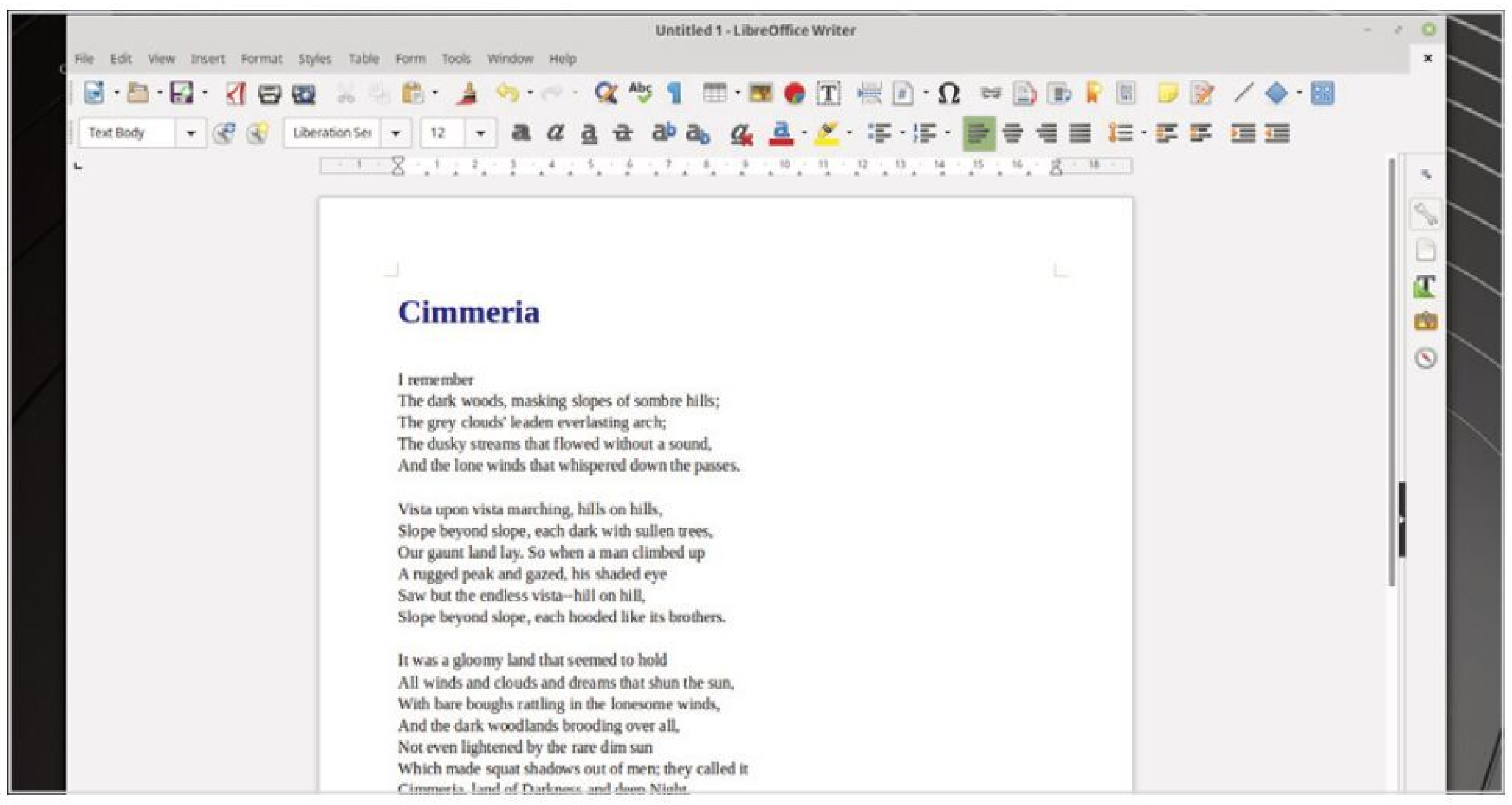
Have a great time and don't hesitate to send us your feedback.

Linux Mint 19.1
Cinnamon 64-bit

**STEP 2** You've already used the Mint Menu to reboot the system and when you first used the Live Environment. This time, click the Menu button and hover over the Office entry in the middle column. This changes the icons represented in the right-hand column, detailing what apps are installed under that section.


All Applications
Accessories
Graphics
Internet
Office
Programming
Sound & Video
Universal Access
Administration
Preferences
Places
Calendar
LibreOffice
LibreOffice Base
LibreOffice Calc
LibreOffice Draw
LibreOffice Impress
LibreOffice Math
LibreOffice Writer

**STEP 3** Launching any of the apps from the Menu is as simple as finding one and clicking it. For example, under the Office section, click on LibreOffice Writer. Writer is the preinstalled word processor for Linux Mint. It opens and saves as Microsoft Word and functions in almost the same way.


Untitled 1 - LibreOffice Writer
File
Edit
View
Insert
Format
Styles
Table
Form
Tools
Window
Help
Text Body
Liberation Ser
12

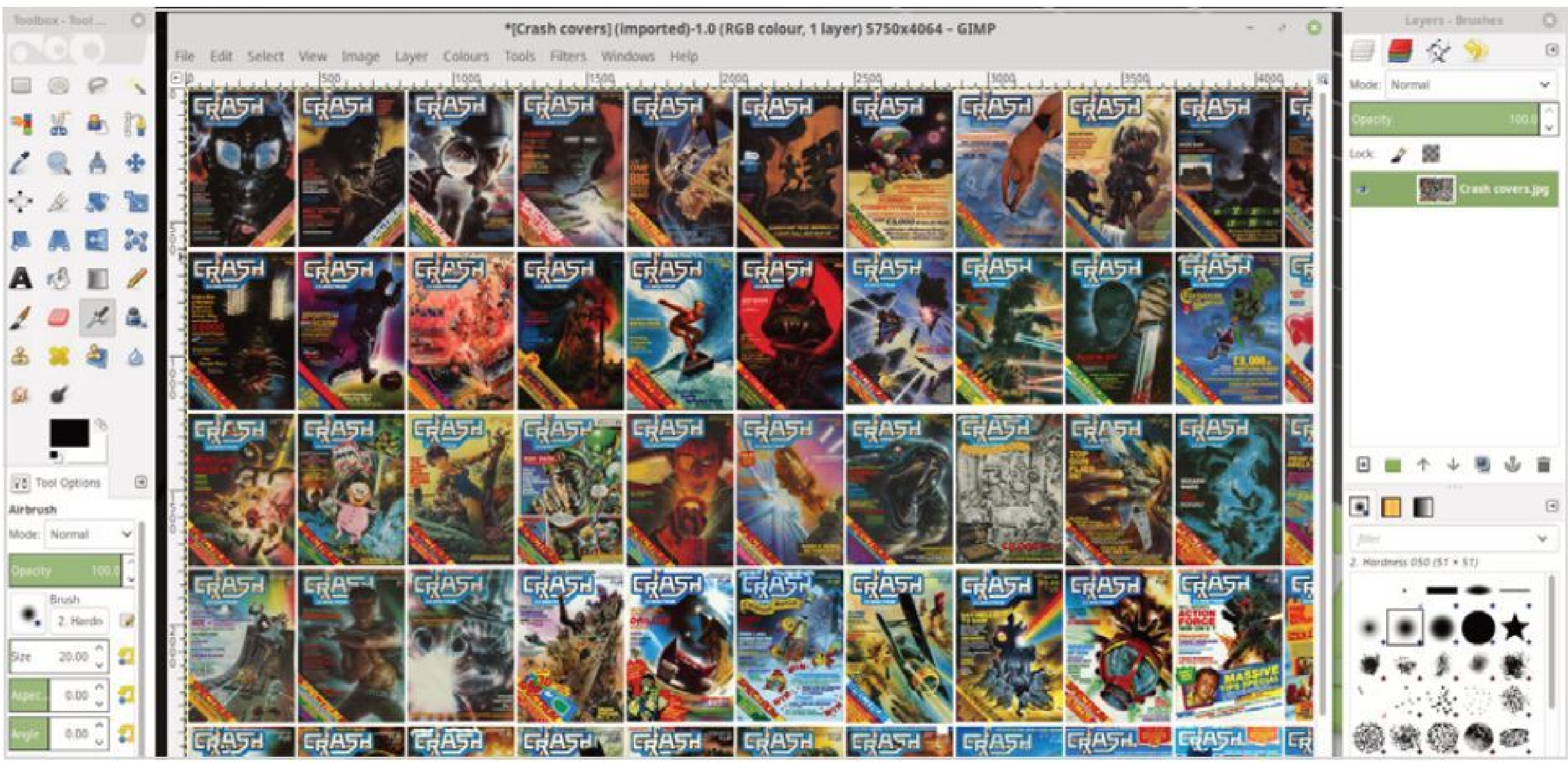
Cimmeria

I remember
The dark woods, masking slopes of sombre hills;
The grey clouds' leaden everlasting arch;
The dusky streams that flowed without a sound,
And the lone winds that whispered down the passes.

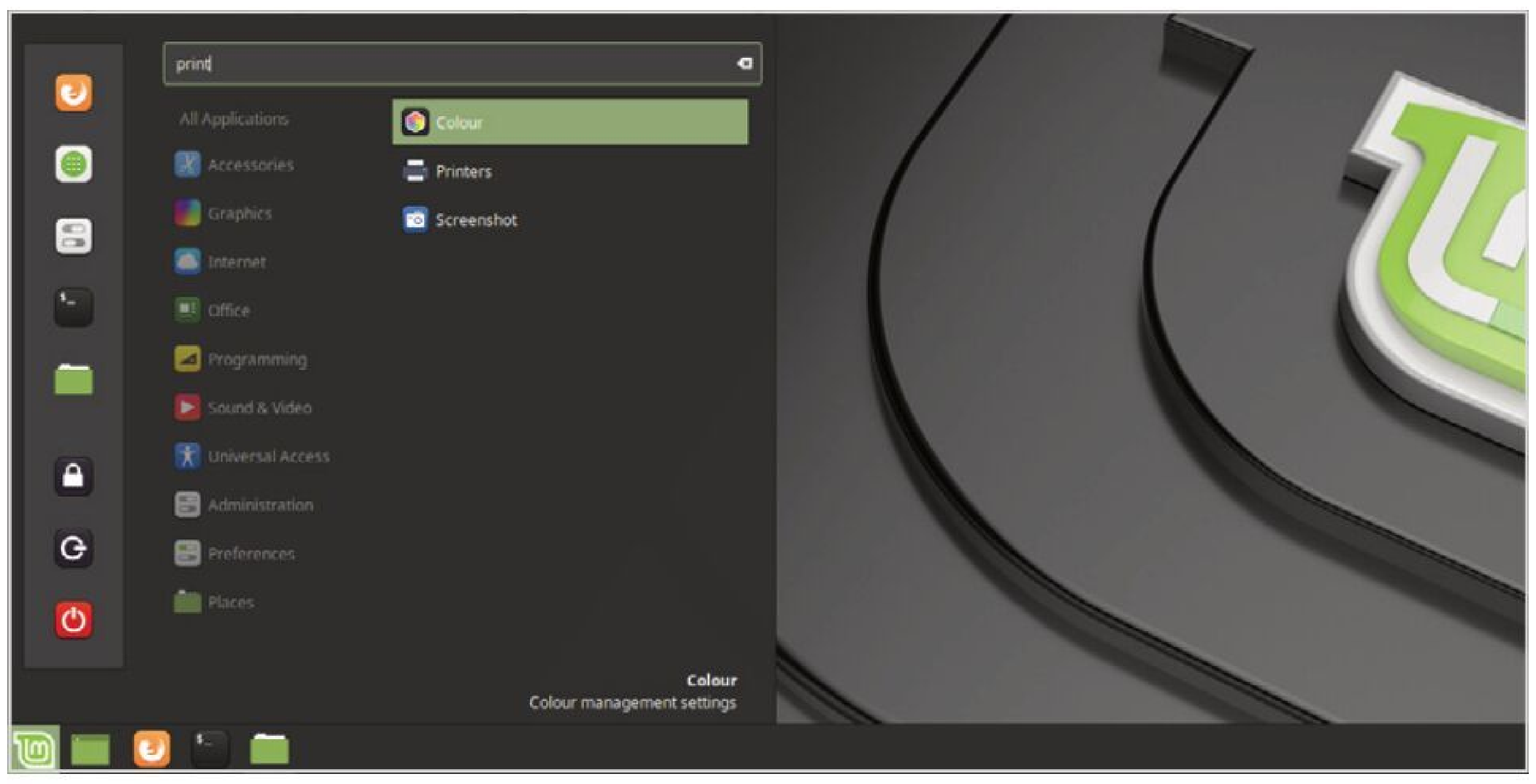
Vista upon vista marching, hills on hills,
Slope beyond slope, each dark with sullen trees,
Our gaunt land lay. So when a man climbed up
A rugged peak and gazed, his shaded eye
Saw but the endless vista--hill on hill,
Slope beyond slope, each hooded like its brothers.

It was a gloomy land that seemed to hold
All winds and clouds and dreams that shun the sun,
With bare boughs rattling in the lonesome winds,
And the dark woodlands brooding over all,
Not even lightened by the rare dim sun
Which made squat shadows out of men; they called it
Cimmeria, land of Darkness and deep Night.

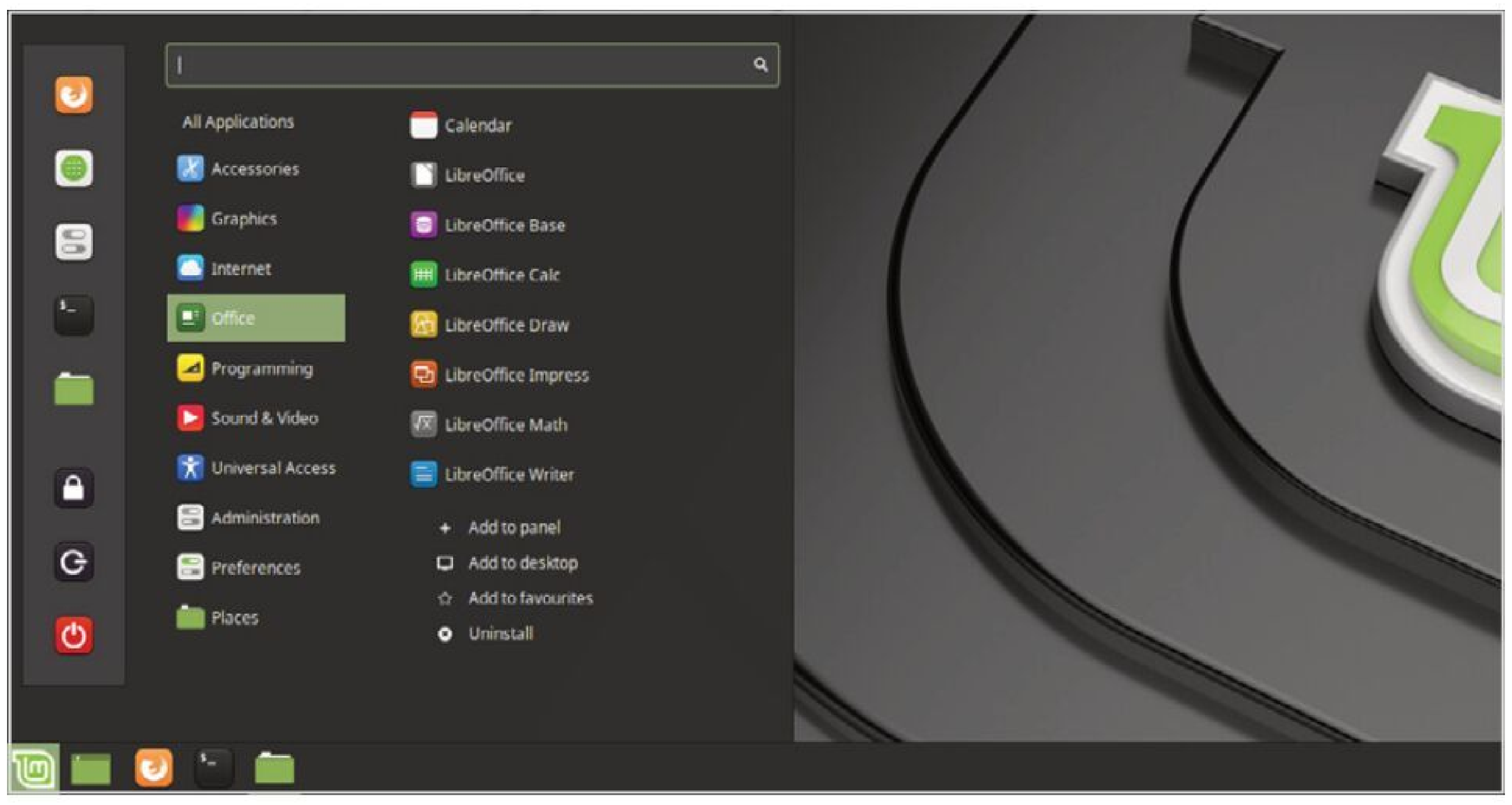
**STEP 4** Open up the Menu again but this time hover the mouse pointer over Graphics, then click on GNU Image Manipulation Program. GIMP is a powerful image manipulation app that's probably as effective as Adobe's Photoshop but requires a little more work to get the results you want. It's certainly worth taking the time to master, though.


*[Crash covers] (imported)-1.0 (RGB colour, 1 layer) 5750x4064 – GIMP
File
Edit
Select
View
Image
Layer
Colours
Tools
Filters
Windows
Help
CRASH
Crash covers.jpg

**STEP 5** If you're looking for a particular function or app, such as setting up a printer, click on the Search box at the top of the Menu box. Start typing the app or function you want, such as printers, and the Mint Menu displays the relevant options below. This works with most modern Linux menus, regardless of the distro.


print
All Applications
Accessories
Graphics
Internet
Office
Programming
Sound & Video
Universal Access
Administration
Preferences
Places
Colour
Printers
Screenshot
Colour
Colour management settings

**STEP 6** Hover over any of the apps listed on the right-hand column and right-click, to be presented with a list of options: Add to Panel, Add to Desktop, Add to Favourites and Uninstall. Most of these options are obvious in their use. Add to Favourites though places the app in the left-hand, quick-access column.


All Applications
Accessories
Graphics
Internet
Office
Programming
Sound & Video
Universal Access
Administration
Preferences
Places
Calendar
LibreOffice
LibreOffice Base
LibreOffice Calc
LibreOffice Draw
LibreOffice Impress
LibreOffice Math
LibreOffice Writer
Add to panel
Add to desktop
Add to favourites
Uninstall

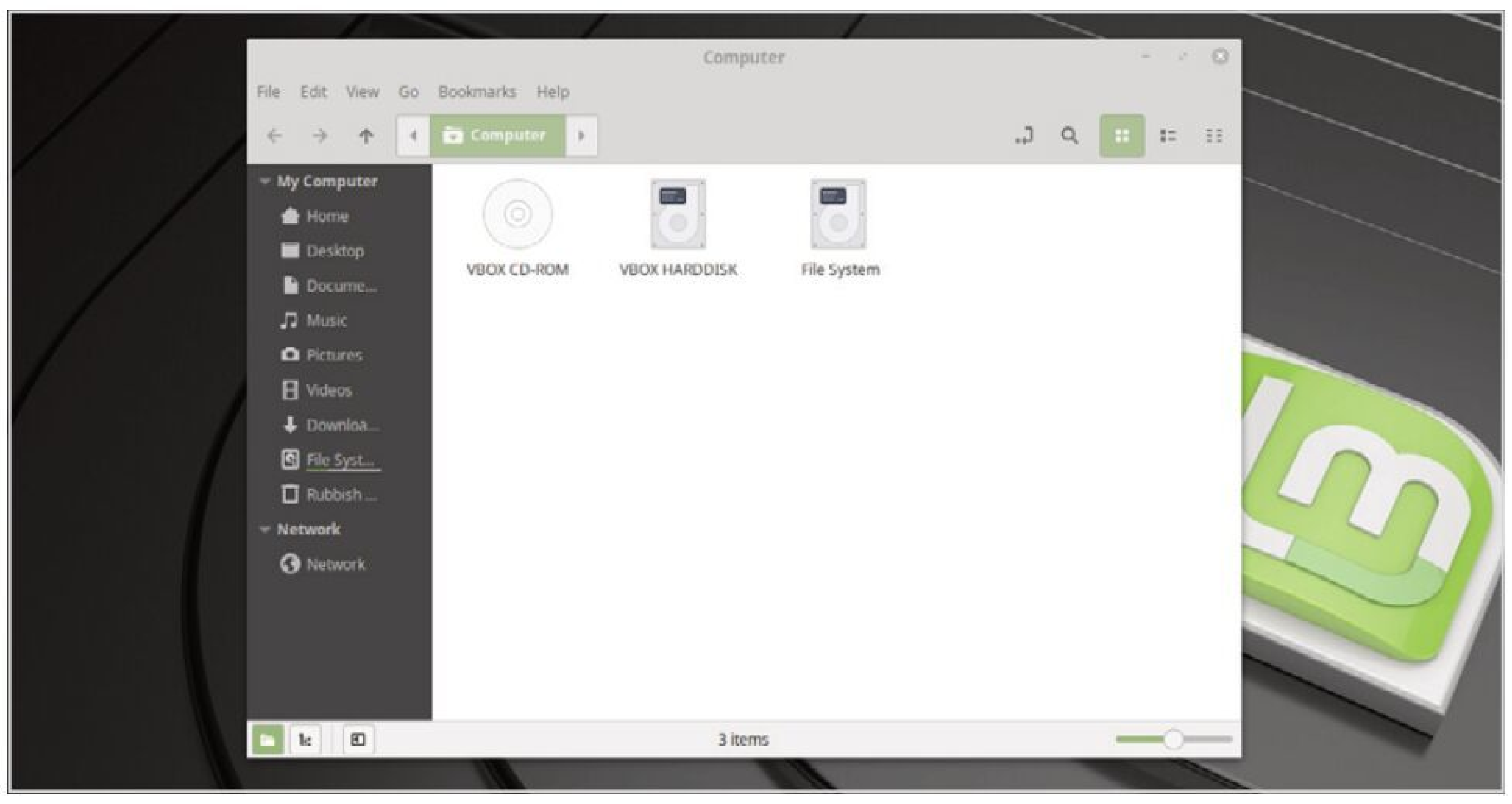
# Navigating the Cinnamon Desktop

Each desktop environment behaves differently to that of the next. Some DEs offer widgets that can be customised and placed on the desktop, others instead opt for a clean, sharp look to keep everything running as fast as possible. Let's see what the Cinnamon desktop has to offer.

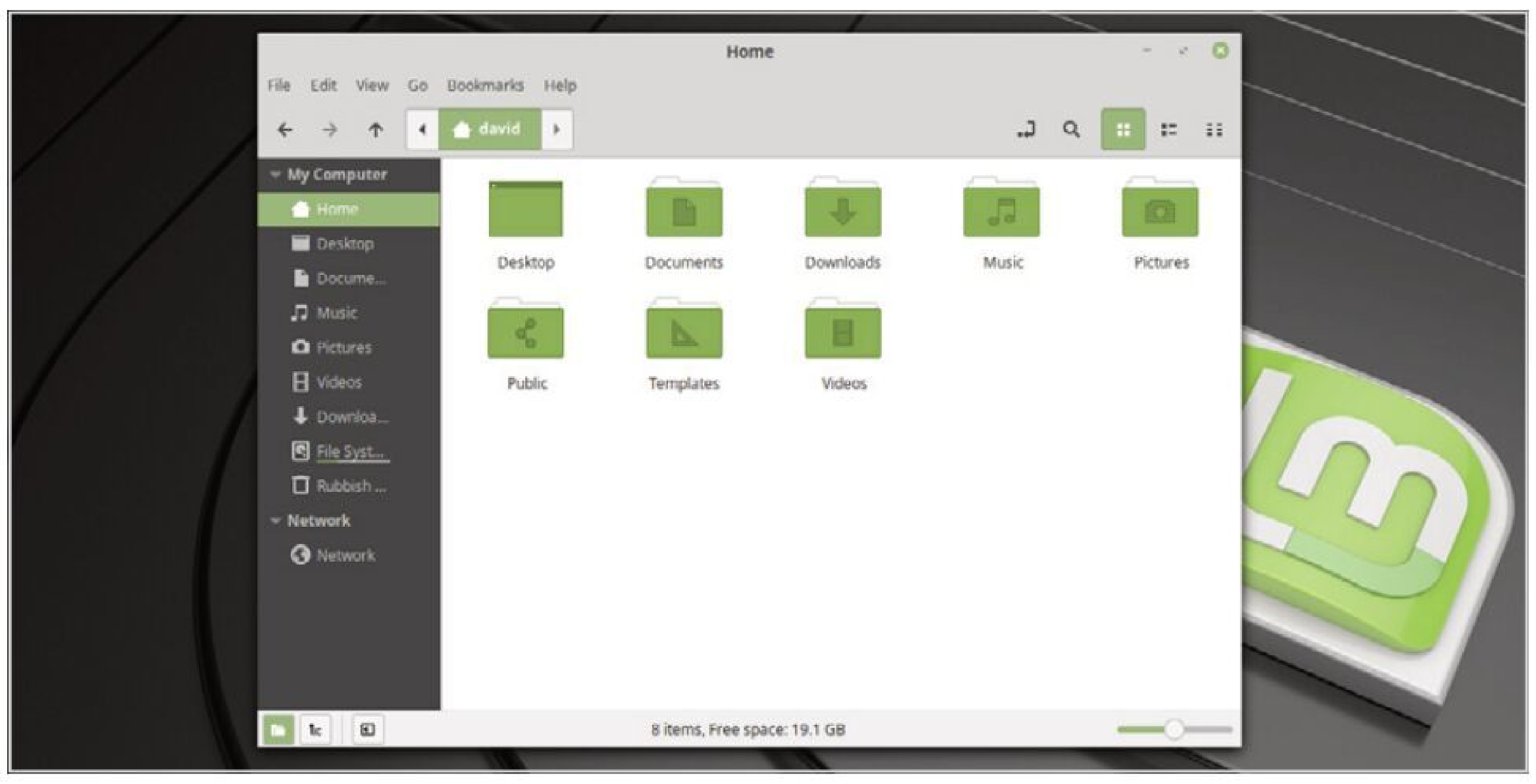
## A TOUCH OF SPICE

**The Cinnamon desktop environment is a great blend of style and performance. There's lots to like about it, which is why it's such a popular DE.**

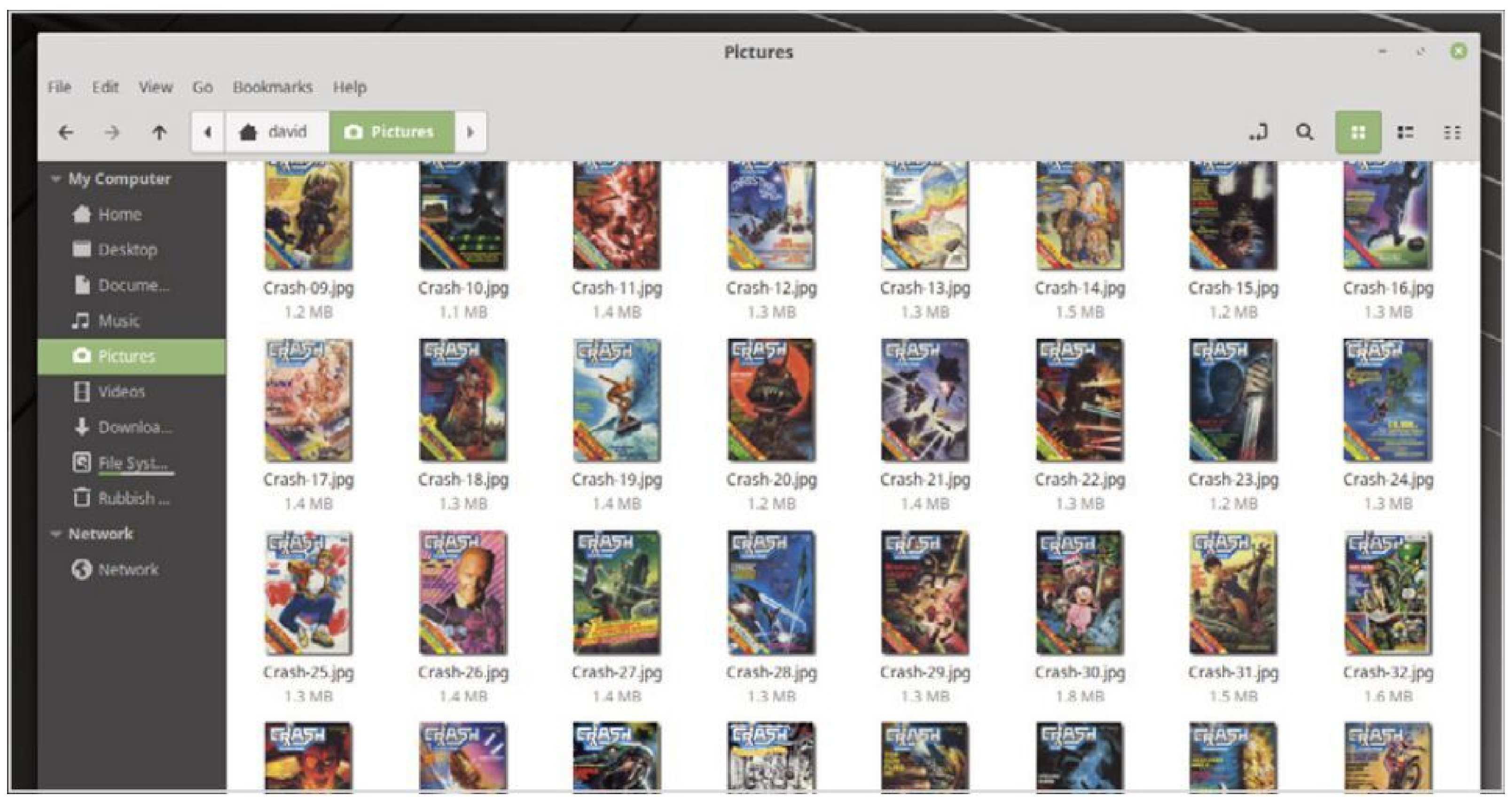
**STEP 1** Begin exploring the Cinnamon desktop by double-clicking the Computer icon. This brings up Nemo, the file manager used in Cinnamon. The Computer icon opens up the root level file system, with access and views to the optical drive (if you have one installed), hard drive and core Linux file system.


Computer
File Edit View Go Bookmarks Help
Computer
My Computer
Home
Desktop
Docume...
Music
Pictures
Videos
Downloa...
File Syst...
Rubbish...
Network
Network
VBOX CD-ROM
VBOX HARDDISK
File System
3 items

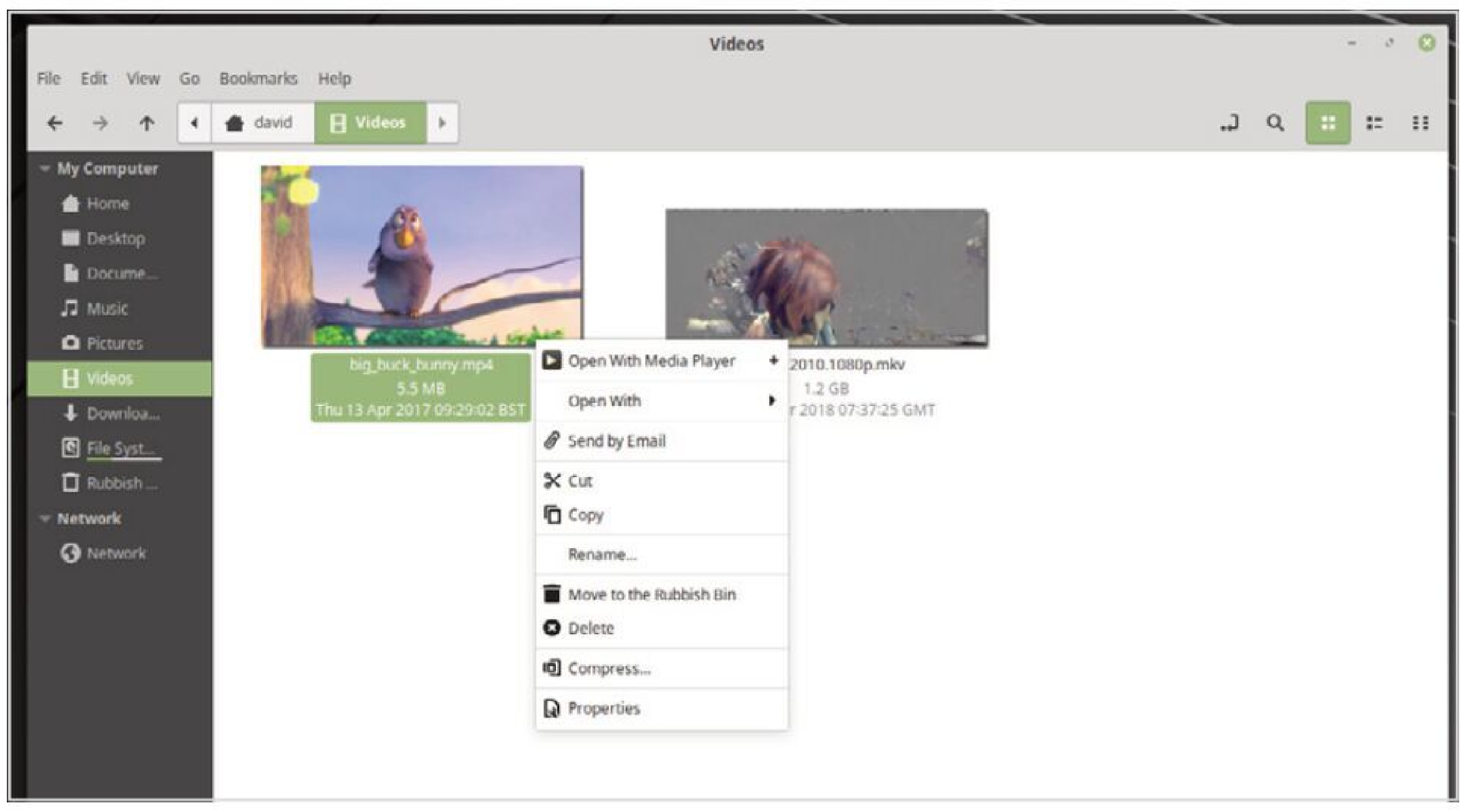
**STEP 2** The Linux file system can appear confusing to a former Windows user, so until you're a little more knowledgeable on how it all works, we'd recommend you concentrate on the Home icon on the desktop instead. In here is everything relating to your user account: where you store Pictures, Videos, Music, Documents, Downloaded items etc.


Home
File Edit View Go Bookmarks Help
david
My Computer
Home
Desktop
Docume...
Music
Pictures
Videos
Downloa...
File Syst...
Rubbish...
Network
Network
Desktop
Documents
Downloads
Music
Pictures
Public
Templates
Videos
8 items, Free space: 19.1 GB

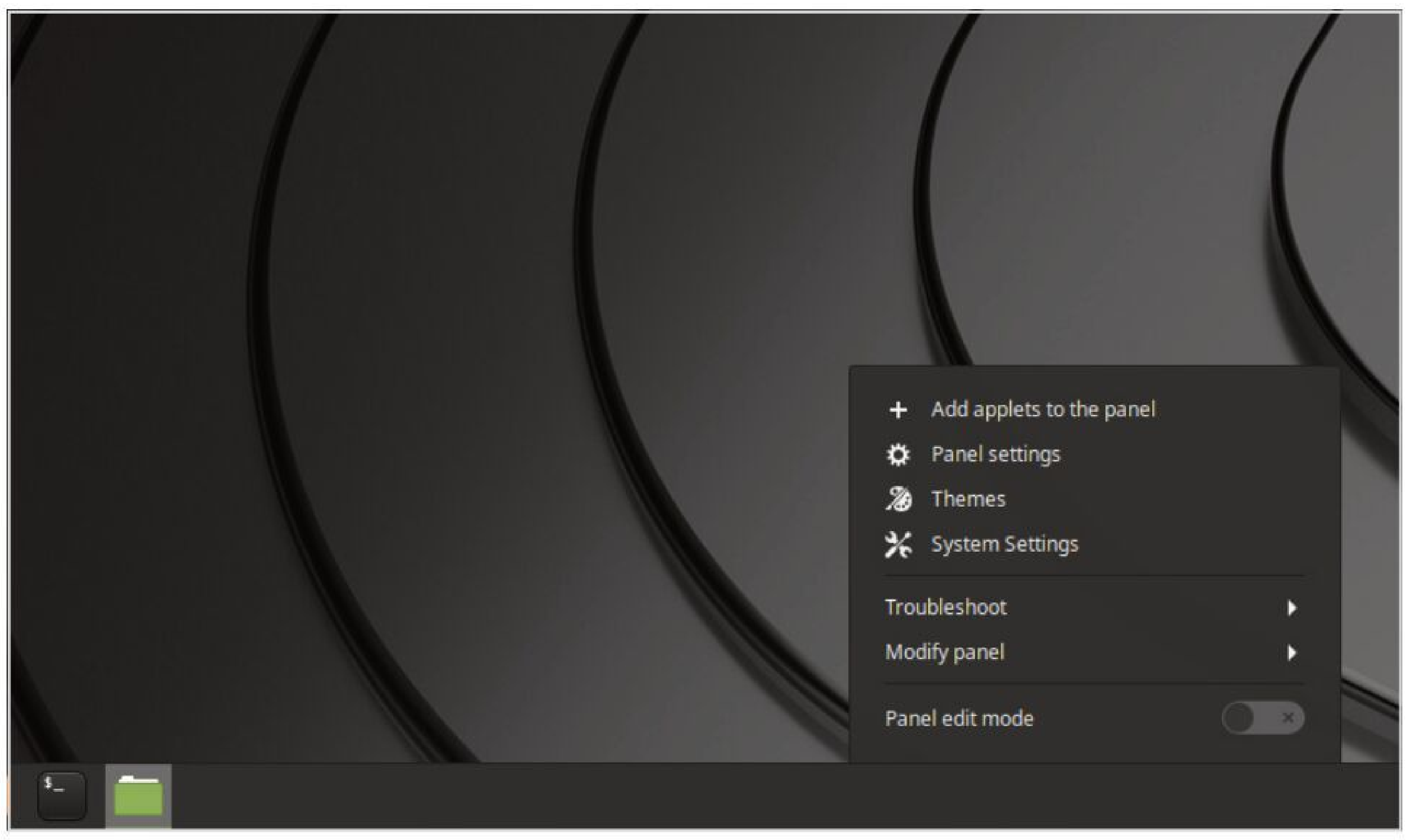
**STEP 3** Nemo has many different features, views and ways so that you can view and manipulate files and folders. For example, if you have any images in the Pictures folder, you can select the icon zoom level for the images by using the slider located in the bottom right of Nemo, labelled Adjust Zoom Level.


Pictures
File Edit View Go Bookmarks Help
david
Pictures
My Computer
Home
Desktop
Docume...
Music
Pictures
Videos
Downloa...
File Syst...
Rubbish...
Network
Network
Crash-09.jpg
Crash-10.jpg
Crash-11.jpg
Crash-12.jpg
Crash-13.jpg
Crash-14.jpg
Crash-15.jpg
Crash-16.jpg
Crash-17.jpg
Crash-18.jpg
Crash-19.jpg
Crash-20.jpg
Crash-21.jpg
Crash-22.jpg
Crash-23.jpg
Crash-24.jpg
Crash-25.jpg
Crash-26.jpg
Crash-27.jpg
Crash-28.jpg
Crash-29.jpg
Crash-30.jpg
Crash-31.jpg
Crash-32.jpg

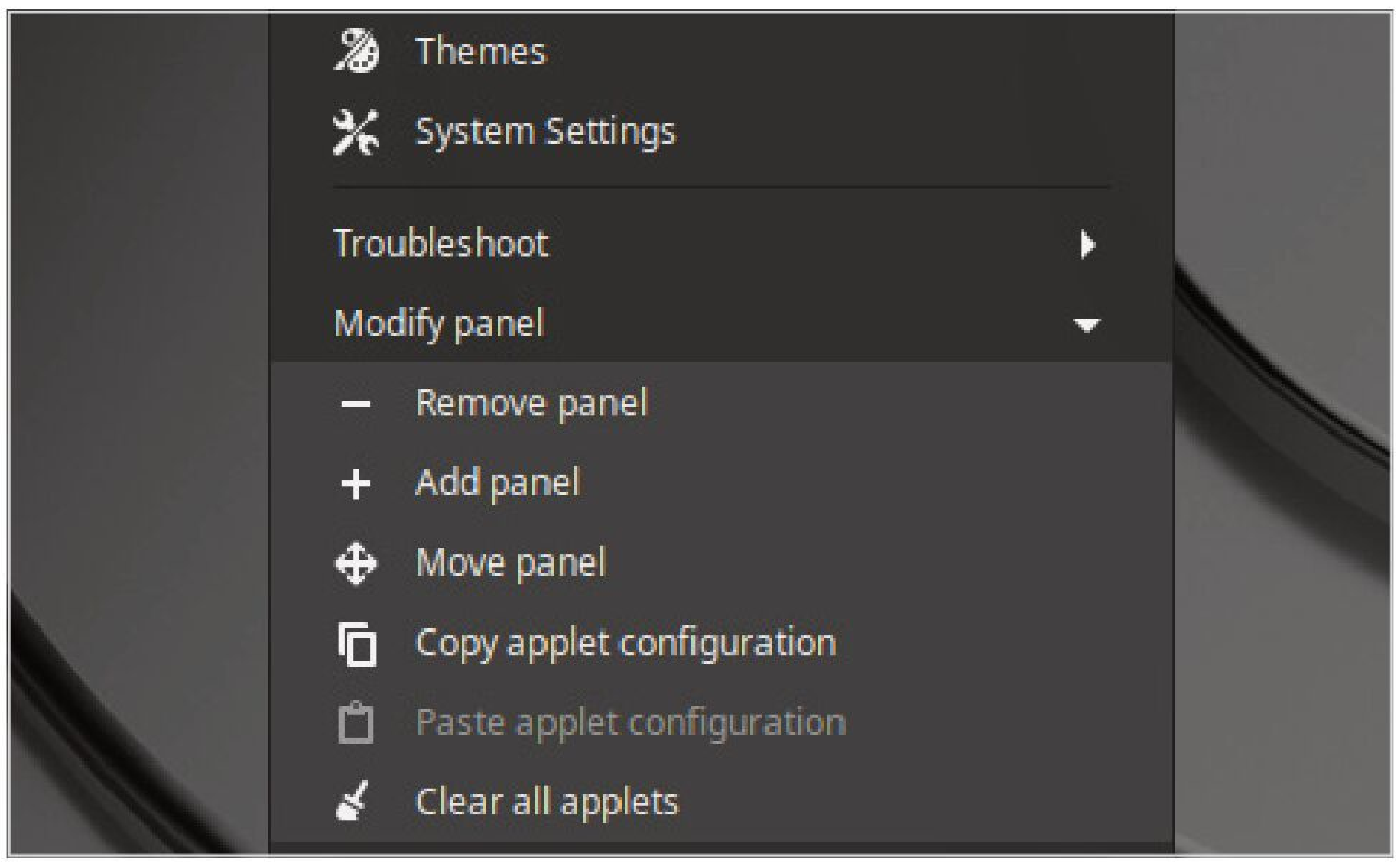
**STEP 4** Just like any good file manager, if you right-click any of the files or folders within you get a wealth of options. In the case of Cinnamon, the defaults allow you to play or view a file depending on what type of file it is and copy, cut, delete, compress, rename, send via email and view its properties.


Videos
File Edit View Go Bookmarks Help
david
Videos
My Computer
Home
Desktop
Docume...
Music
Pictures
Videos
Downloa...
File Syst...
Rubbish...
Network
Network
big_buck_bunny.mp4
5.5 MB
Thu 13 Apr 2017 09:29:02 BST
Open With Media Player
Open With
Send by Email
Cut
Copy
Rename...
Move to the Rubbish Bin
Delete
Compress...
Properties
2010.1080p.mkv
1.2 GB

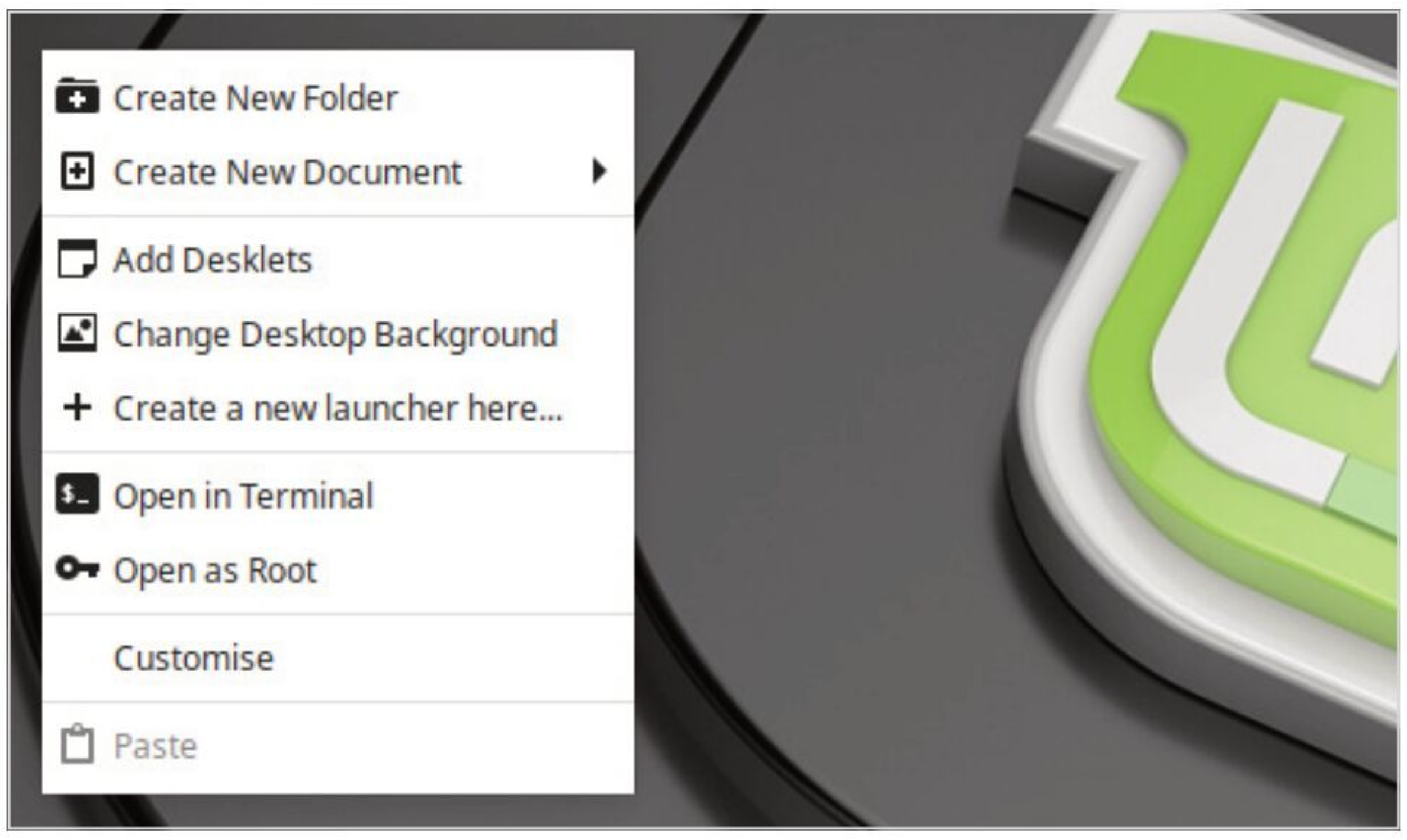
**STEP 5** At the bottom of the desktop there's the Panel. We've already looked at one section of the Panel, the Menu. If you right-click anywhere on the Panel, other than on a Panel app, you see a menu allowing you to edit, add and set up the Panel in a different way.


Add applets to the panel
Panel settings
Themes
System Settings
Troubleshoot
Modify panel
Panel edit mode

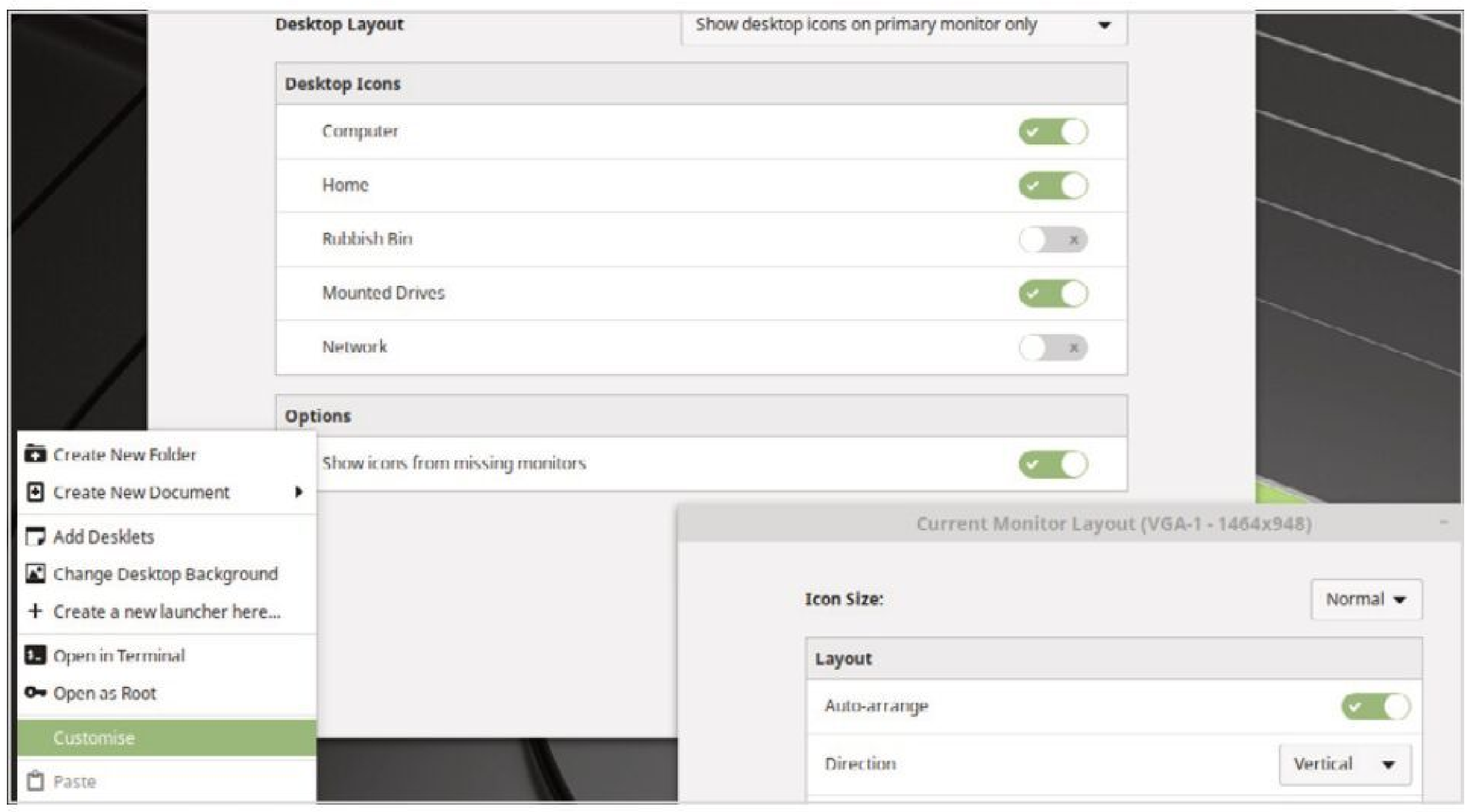
**STEP 6** For example, if you click the option Modify Panel, you can remove, move, remove the Panel, add a new one and clear it of any Applets that are currently present. An Applet, by the way, is an app that's designed to work and fit into the Cinnamon Panel.


Themes
System Settings
Troubleshoot
Modify panel
Remove panel
Add panel
Move panel
Copy applet configuration
Paste applet configuration
Clear all applets

**STEP 7** If you right-click anywhere on the Cinnamon desktop you see a set of options that allows you to further add to, edit or view the desktop content differently. It's very similar to that of Windows, which is why Mint is a good choice for ex-Windows users.


Create New Folder
Create New Document
Add Desklets
Change Desktop Background
Create a new launcher here...
Open in Terminal
Open as Root
Customise
Paste

**STEP 8** From that desktop right-click, context menu, select Customise, followed by the Desktop Settings link at the bottom of the newly opened window. This opens a new window where you're able to edit which desktop icons are present. If you're using a setup with multiple monitors attached, you can also choose which monitor displays which icons.

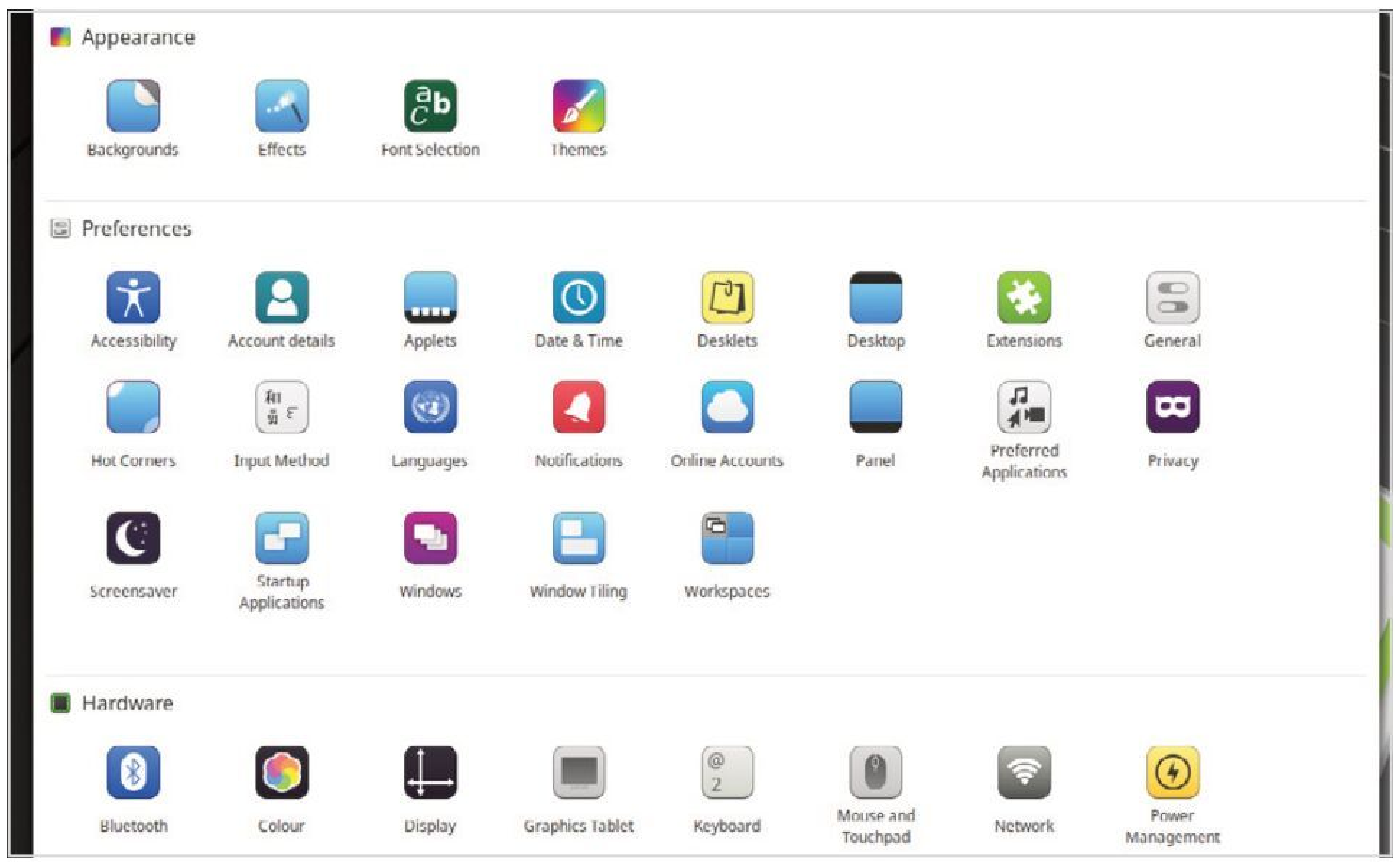

Desktop Layout: Show desktop icons on primary monitor only

Desktop Icons
Computer ☑
Home ☑
Rubbish Bin ☐
Mounted Drives ☑
Network ☐

Options
Show icons from missing monitors ☑

Current Monitor Layout (VGA-1 - 1464x948)
Icon Size: Normal
Layout
Auto-arrange ☑
Direction: Vertical
Create New Folder
Create New Document
Add Desklets
Change Desktop Background
Create a new launcher here...
Open in Terminal
Open as Root
Customise
Paste

**STEP 9** Click on the Menu and type system settings and open the resulting icon. This takes you to the System Settings options. From here you're able to control and edit the way Linux Mint Cinnamon looks and works as well add new users, manage the firewall and enable accessibility options.


Appearance
Backgrounds
Effects
Font Selection
Themes
Preferences
Accessibility
Account details
Applets
Date & Time
Desklets
Desktop
Extensions
General
Hot Corners
Input Method
Languages
Notifications
Online Accounts
Panel
Preferred Applications
Privacy
Screensaver
Startup Applications
Windows
Window Tiling
Workspaces
Hardware
Bluetooth
Colour
Display
Graphics Tablet
Keyboard
Mouse and Touchpad
Network
Power Management

**STEP 10** In short, Linux Mint Cinnamon can be configured to look quite extraordinary. There are many examples available of how good it can get and what can be achieved. You can go as complex or as simple as you want, adding different component and animations or just keeping it plain and easy to read.

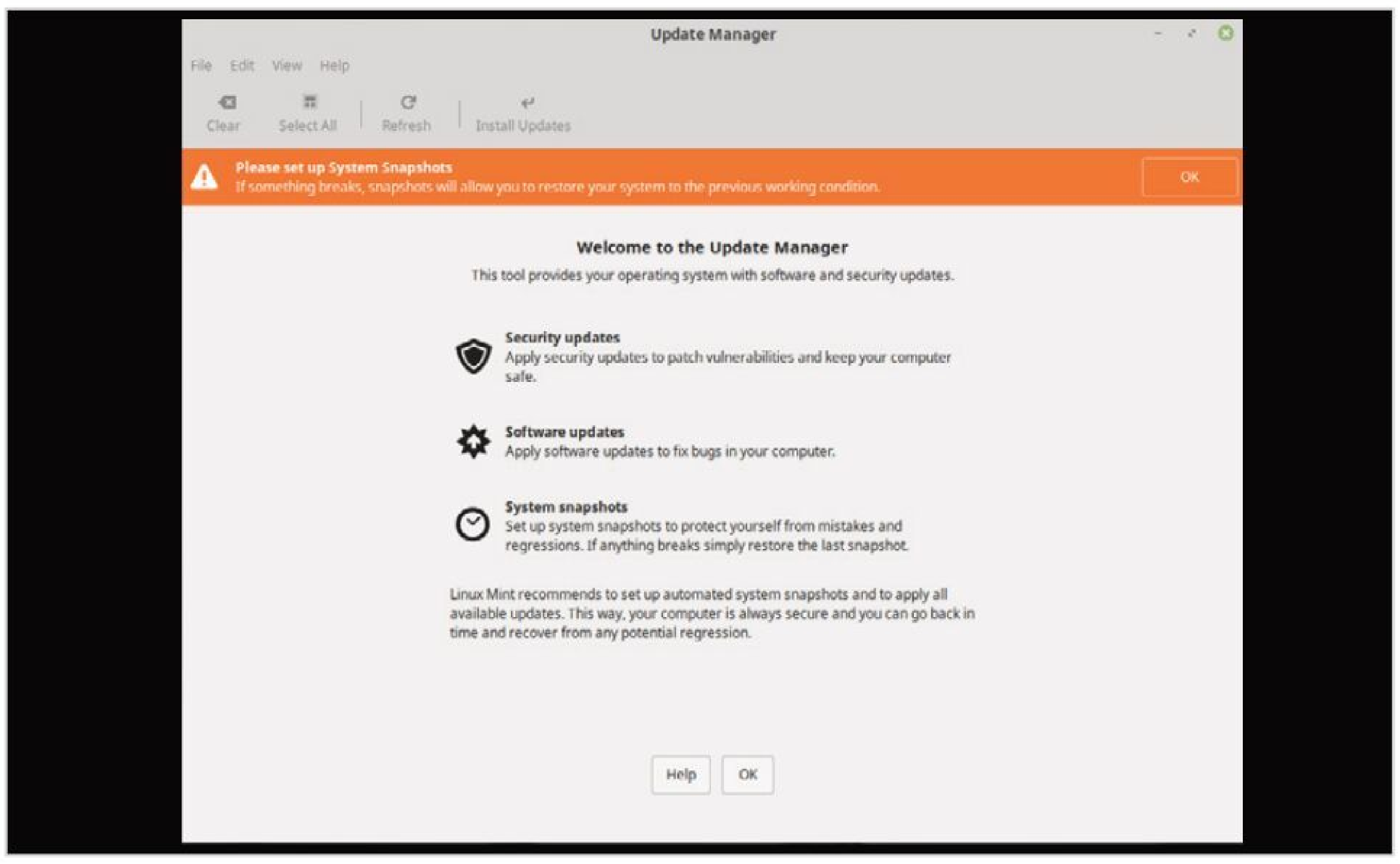
# 10 Things to do After Installing Linux Mint

Linux Mint is a polished distro out of the box but, as with most Linux distros, there are some tweaks that can be applied to improve the way it works. Although these are Mint-specific tweaks, most can be applied to other distros.

## LINUX TWEAKS

**Some of these post-installation actions are highly recommended, while others are just handy additions and simply tweak the system or add a customisation.**

**STEP 1** The first, and most important, post-installation action is to update the system. Click on the shield icon in the Panel, found at the bottom right of the desktop next to the time and date. This launches the Update Manager.



**Please set up System Snapshots**
If something breaks, snapshots will allow you to restore your system to the previous working condition.

**Welcome to the Update Manager**

This tool provides your operating system with software and security updates.

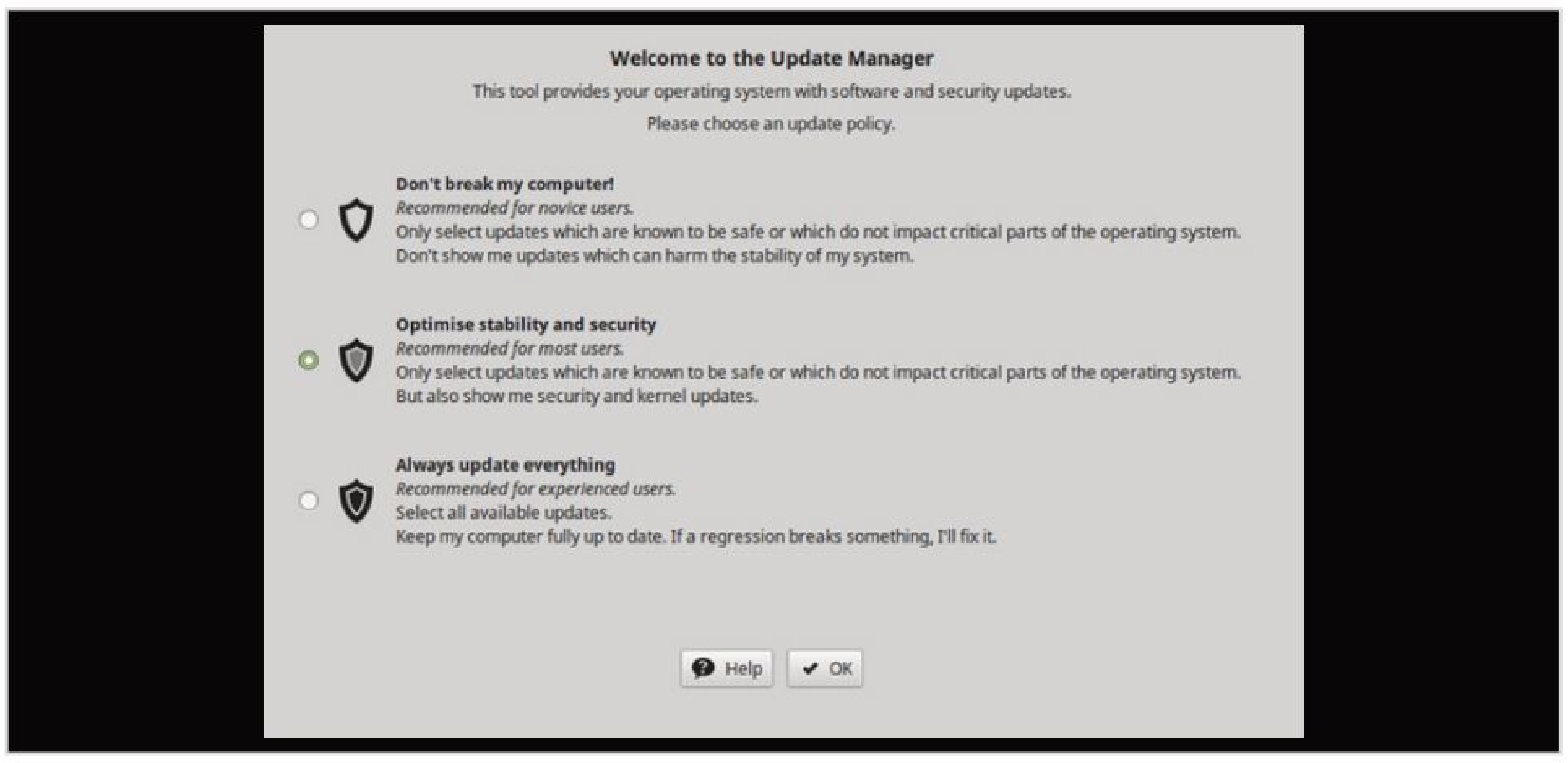
**Security updates**
Apply security updates to patch vulnerabilities and keep your computer safe.

**Software updates**
Apply software updates to fix bugs in your computer.

**System snapshots**
Set up system snapshots to protect yourself from mistakes and regressions. If anything breaks simply restore the last snapshot.

Linux Mint recommends to set up automated system snapshots and to apply all available updates. This way, your computer is always secure and you can go back in time and recover from any potential regression.

**STEP 2** Linux Mint offers the user a three level policy approach to updates: Don't Break My Computer, Optimise Stability and Security and Always Update Everything. The recommended option is the Optimise Stability and Security, which only updates safe, essential patches that won't impact critical elements of the core OS. Read through the descriptions but choose the middle, and recommended option.



**Welcome to the Update Manager**

This tool provides your operating system with software and security updates.

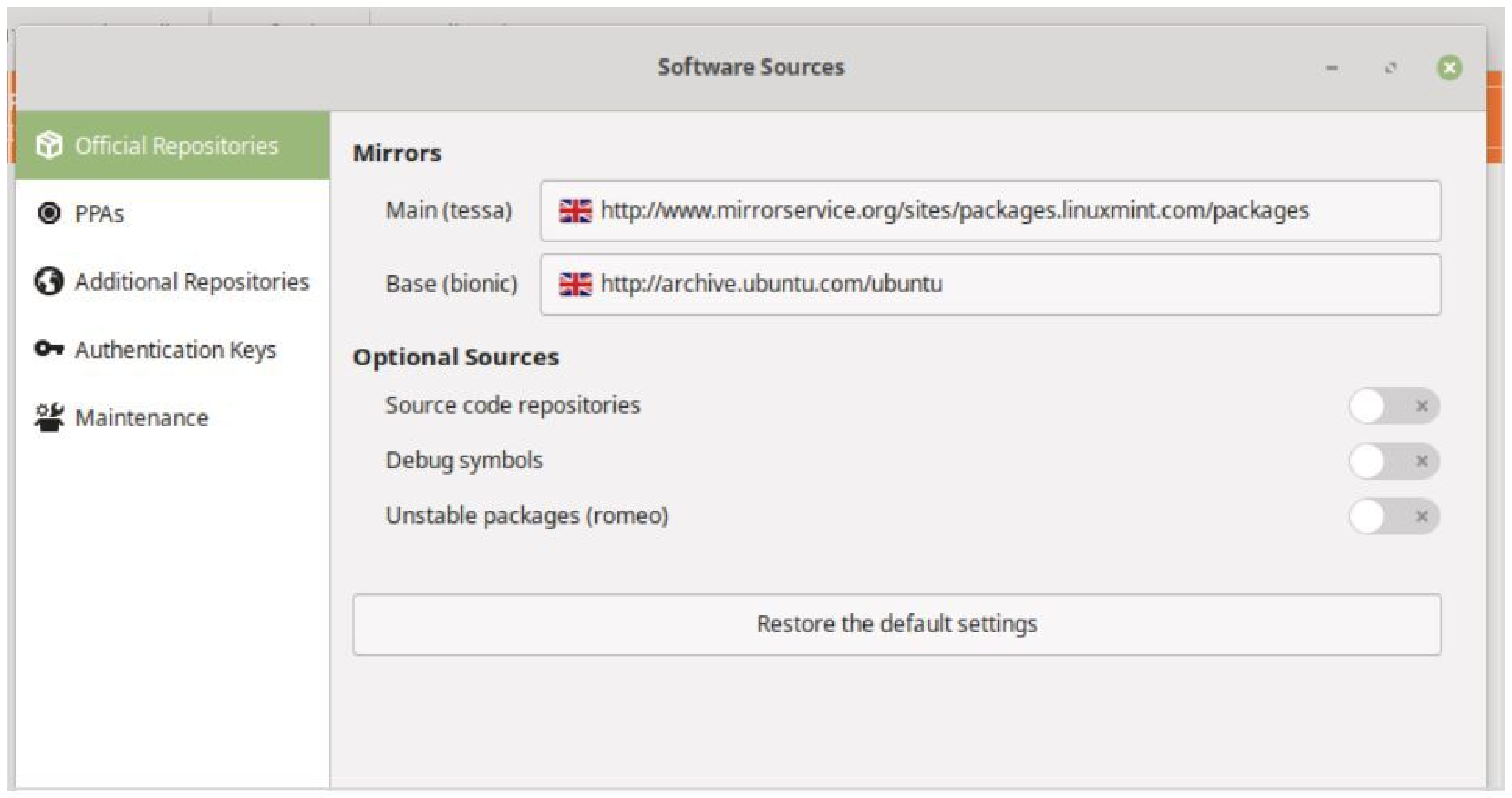
Please choose an update policy.

○ **Don't break my computer!**
*Recommended for novice users.*
Only select updates which are known to be safe or which do not impact critical parts of the operating system.
Don't show me updates which can harm the stability of my system.

● **Optimise stability and security**
*Recommended for most users.*
Only select updates which are known to be safe or which do not impact critical parts of the operating system.
But also show me security and kernel updates.

○ **Always update everything**
*Recommended for experienced users.*
Select all available updates.
Keep my computer fully up to date. If a regression breaks something, I'll fix it.

**STEP 3** Click the OK button and you can see a couple of updates ready for installation. Before you update though, click on the blue bar OK button to switch to a Local Mirror. This opens the Software Sources option. In the Mirrors section, click on the Main and Base drop-down menus and select a server closest to your current location.



**Mirrors**

Main (tessa) http://www.mirrorservice.org/sites/packages.linuxmint.com/packages

Base (bionic) http://archive.ubuntu.com/ubuntu

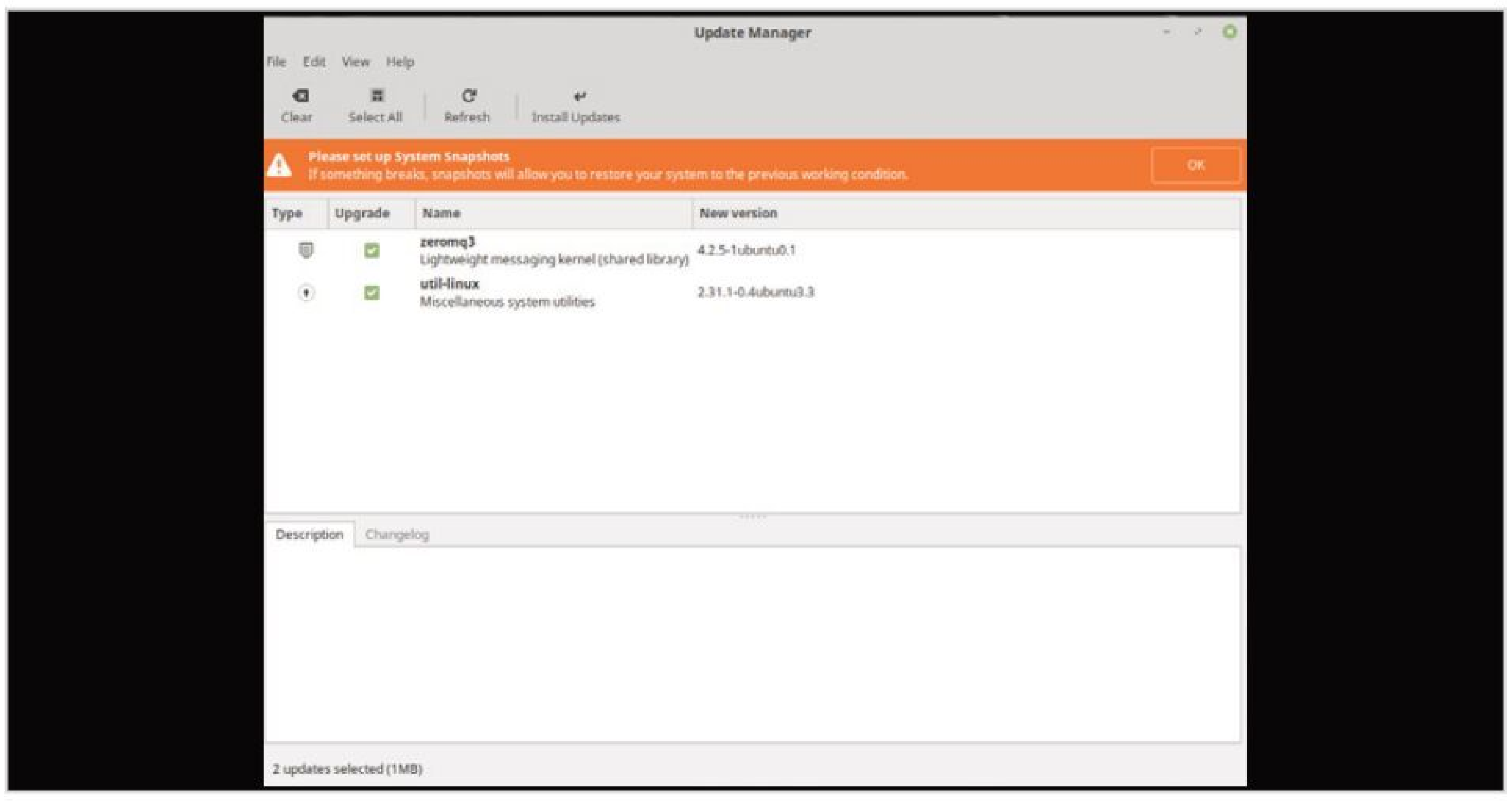
**Optional Sources**

Source code repositories

Debug symbols

Unstable packages (romeo)

**STEP 4** Click the Update the Cache button and close the Software Sources window. Back in the Update Manager, click on the Install Updates icon and enter your password. The updates automatically apply themselves and relaunch Update Manager, this time with a lot more updates. Again, click Install Updates, OK any messages and wait for them to finish.

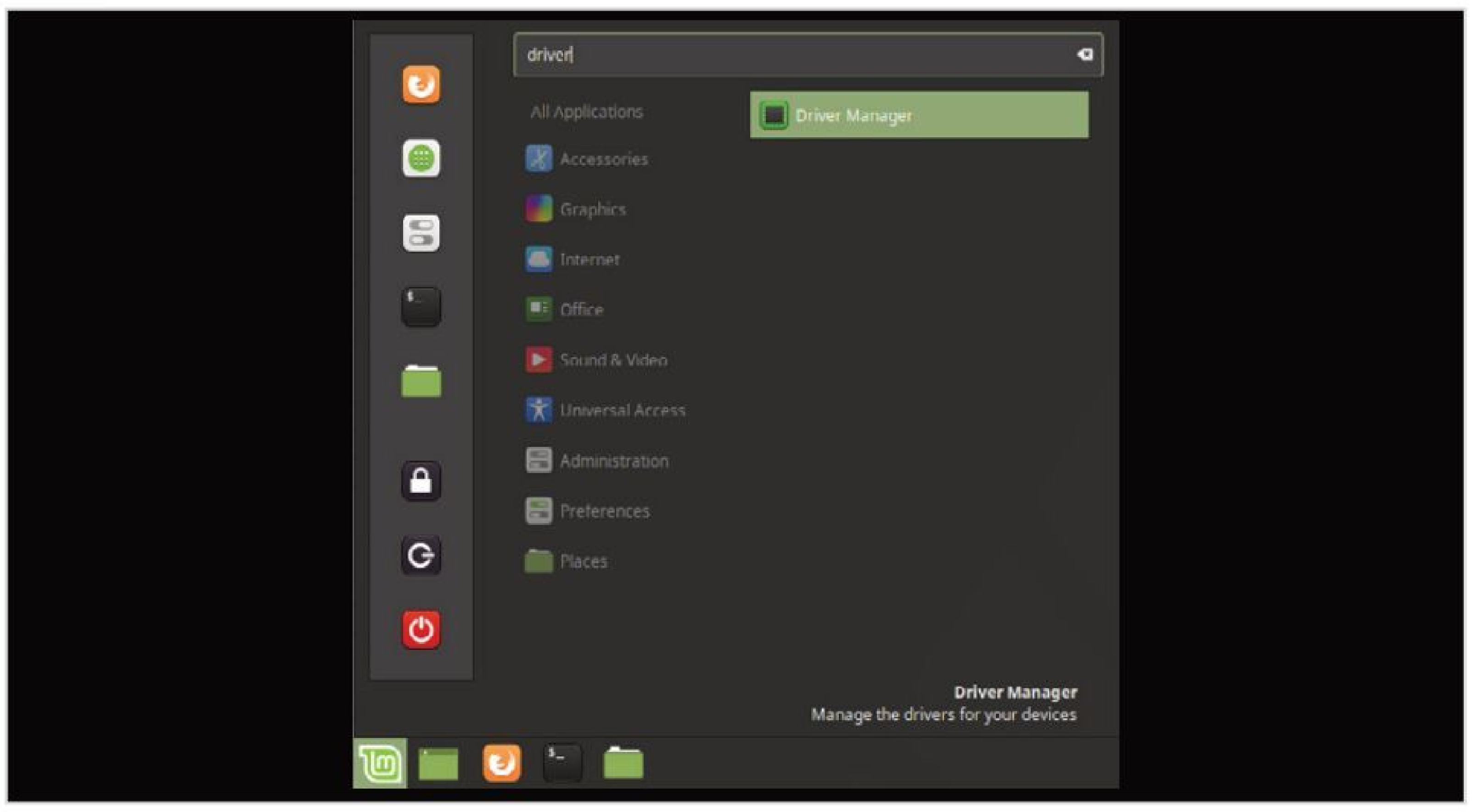


**Please set up System Snapshots**
If something breaks, snapshots will allow you to restore your system to the previous working condition.

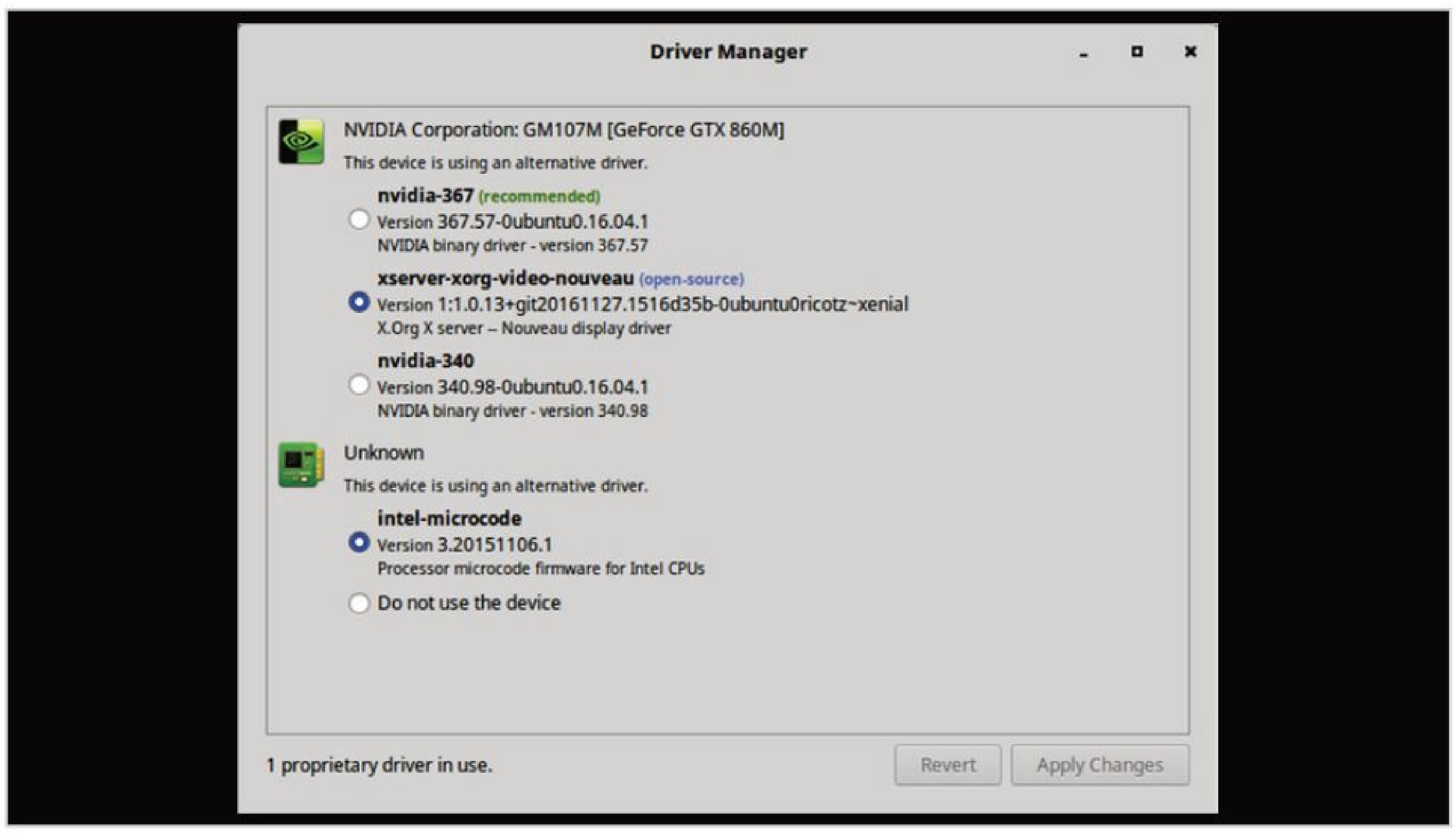
| Type | Upgrade | Name | New version |
|---|---|---|---|
|  | ☑ | **zeromq3**<br>Lightweight messaging kernel (shared library) | 4.2.5-1ubuntu0.1 |
|  | ☑ | **util-linux**<br>Miscellaneous system utilities | 2.31.1-0.4ubuntu3.3 |

2 updates selected (1MB)

**STEP 5** The updates are graded by level, 1 being a low level update, level 5 being a dangerous one. Stick to level 3 updates, is our advice; and click Replace for any messages regarding overwriting a configuration file. With regards to the Software Rendering issue and lack of drivers for non-VirtualBox users, click the Menu and type ‘driver’ into the search box.


driver
All Applications
Driver Manager
Accessories
Graphics
Internet
Office
Sound & Video
Universal Access
Administration
Preferences
Places
Driver Manager
Manage the drivers for your devices

**STEP 6** Click the Driver Manager app that appears as a result of the search and enter your password. Mint takes a moment to analyse what’s available and presents you with a selection of potential drivers based on your detected hardware. Those with graphical problems, such as Software Rendering, should opt to use the latest, recommended Graphics driver.


Driver Manager
Revert
Apply Changes

NVIDIA Corporation: GM107M [GeForce GTX 860M]

This device is using an alternative driver.

○ **nvidia-367** (recommended)
Version 367.57-0ubuntu0.16.04.1
NVIDIA binary driver - version 367.57

● **xserver-xorg-video-nouveau** (open-source)
Version 1:1.0.13+git20161127.1516d35b-0ubuntu0ricotz~xenial
X.Org X server – Nouveau display driver

○ **nvidia-340**
Version 340.98-0ubuntu0.16.04.1
NVIDIA binary driver - version 340.98

Unknown

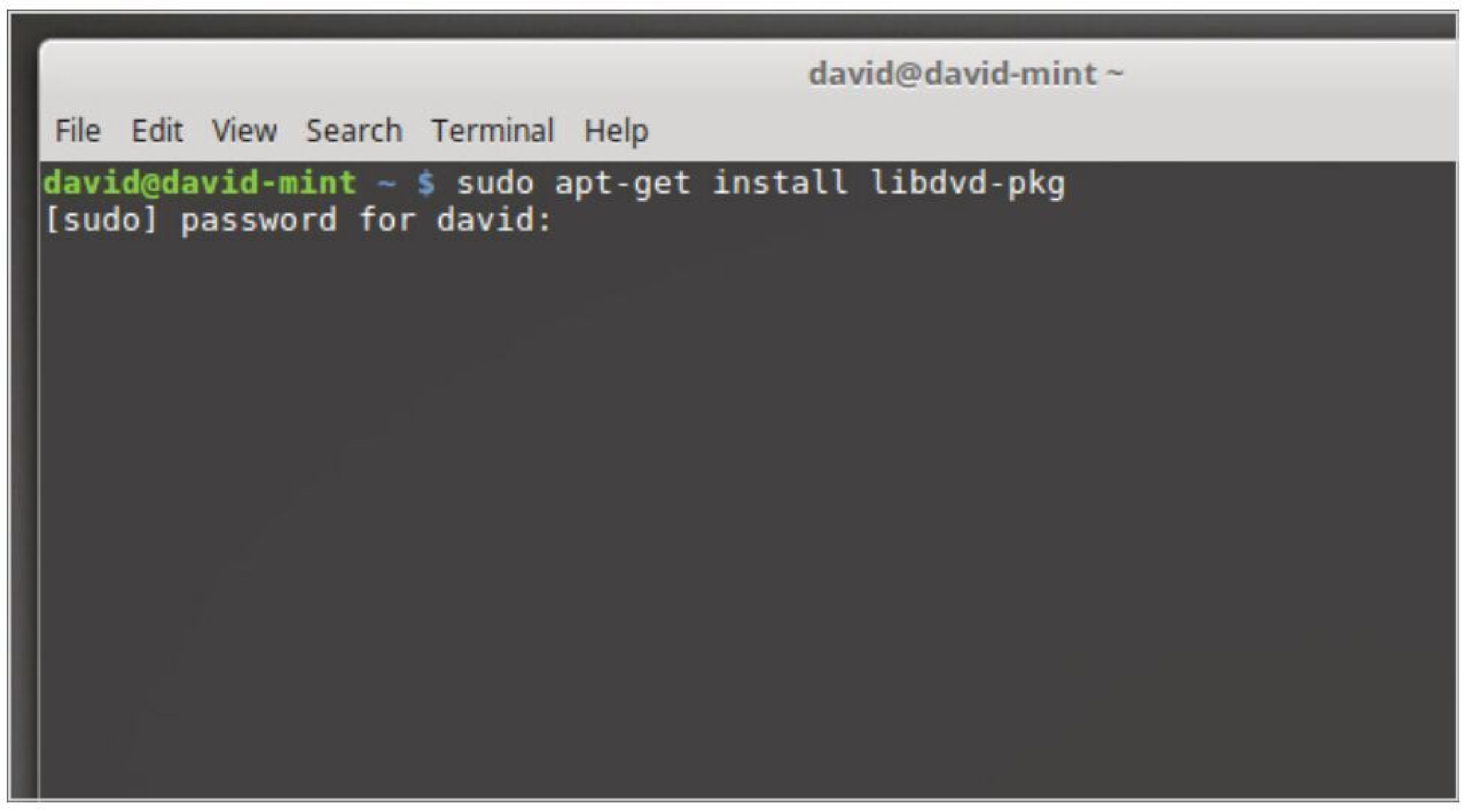
This device is using an alternative driver.

● **intel-microcode**
Version 3.20151106.1
Processor microcode firmware for Intel CPUs

○ Do not use the device

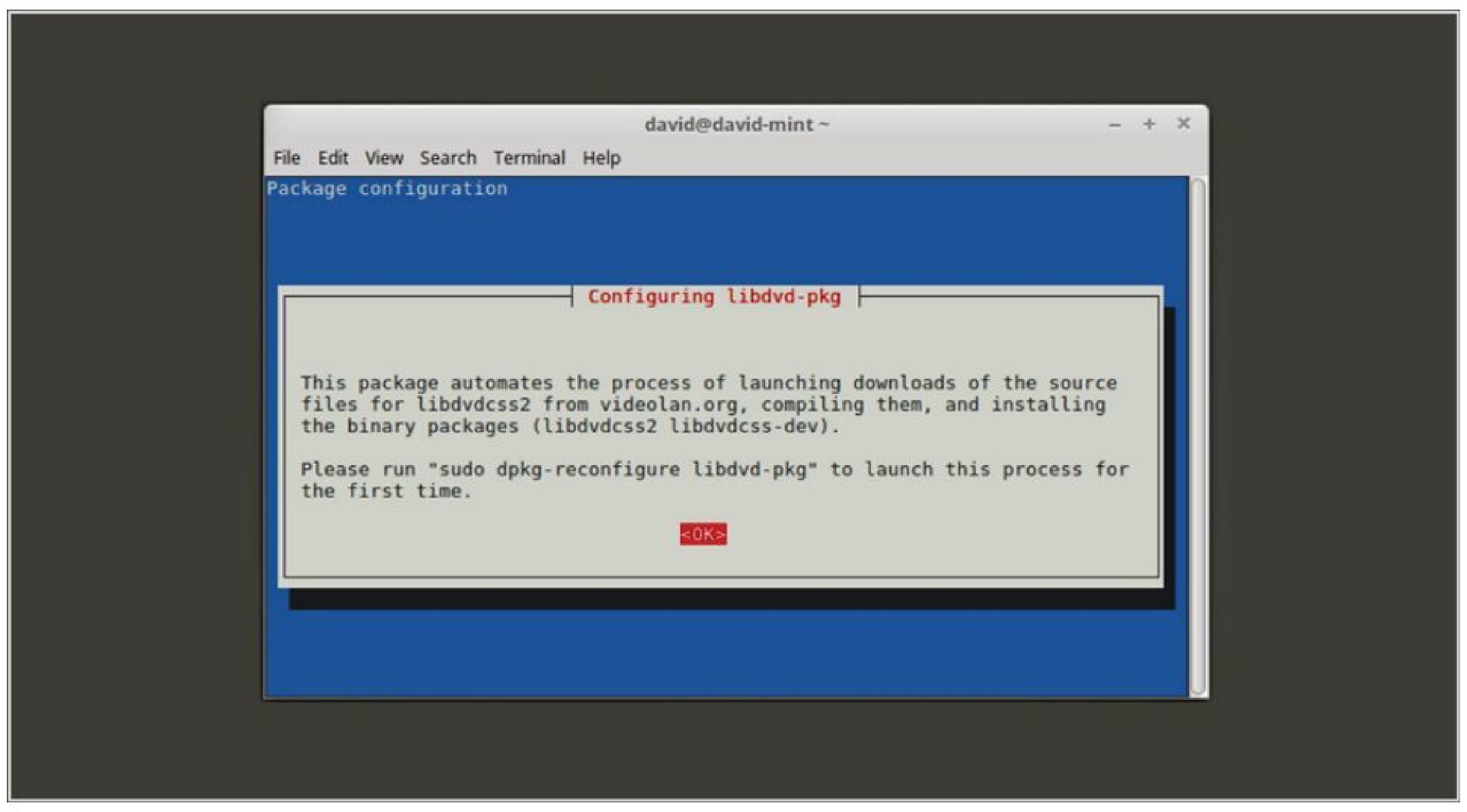
1 proprietary driver in use.

**STEP 7** At this point you’ll probably need to restart Linux Mint, so do that now. After a reboot click the Menu button again, followed by the Terminal. The Terminal icon is found in the left-hand column, above the Files icon. With the Terminal open, enter: `sudo apt-get install libdvd-pkg`, press Enter and type in your password. This enables encrypted DVD playback.


david@david-mint ~
File Edit View Search Terminal Help

```
david@david-mint ~ $ sudo apt-get install libdvd-pkg
[sudo] password for david:
```

**STEP 8** When asked to accept the changes, enter Y and also when asked to configure libdvd. Make sure OK is highlighted and press Enter, then Yes to any further questions. Next up, still in the Terminal, enter: `cat /proc/sys/vm/swappiness`; the result should be 60. If your computer has less than 4GB of RAM/memory, then enter: `gksudo xed /etc/sysctl.conf`.


david@david-mint ~
File Edit View Search Terminal Help

```
Package configuration

┤ Configuring libdvd-pkg ├

This package automates the process of launching downloads of the source
files for libdvdcss2 from videolan.org, compiling them, and installing
the binary packages (libdvdcss2 libdvdcss-dev).

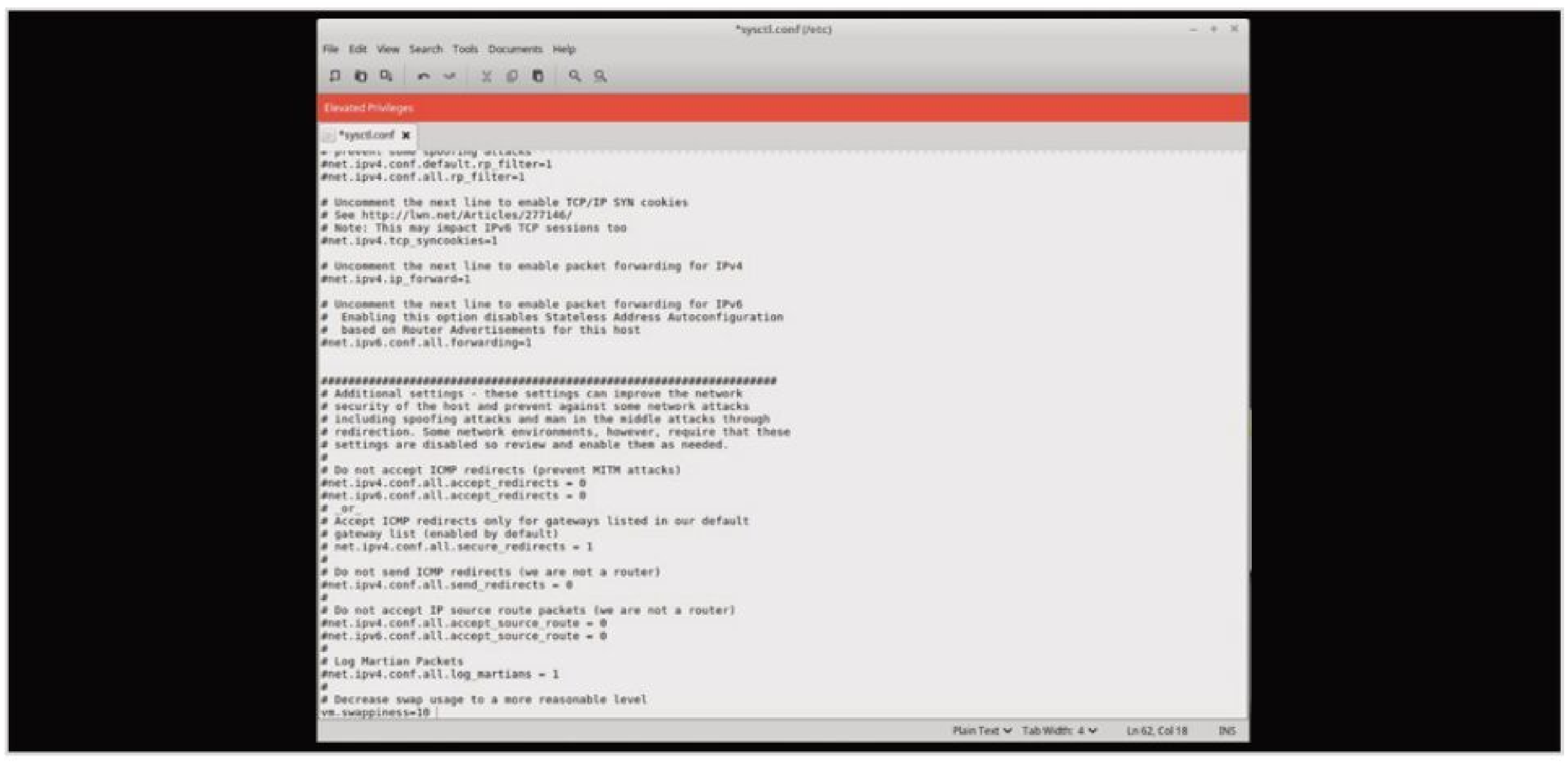
Please run "sudo dpkg-reconfigure libdvd-pkg" to launch this process for
the first time.

<OK>
```

**STEP 9** This tweak helps speed up systems with less than 4GB RAM/memory. Scroll down to the bottom of the file you just opened and add the following new lines:

```
# Decrease swap usage to a more reasonable level
vm.swappiness=10
```

Click File > Save, then File > Quit. Reboot Linux Mint and you should notice a slight hike in performance.


*sysctl.conf (/etc)
File Edit View Search Tools Documents Help
Elevated Privileges
*sysctl.conf
Plain Text
Tab Width: 4
Ln 62, Col 18
INS

```
#net.ipv4.conf.default.rp_filter=1
#net.ipv4.conf.all.rp_filter=1

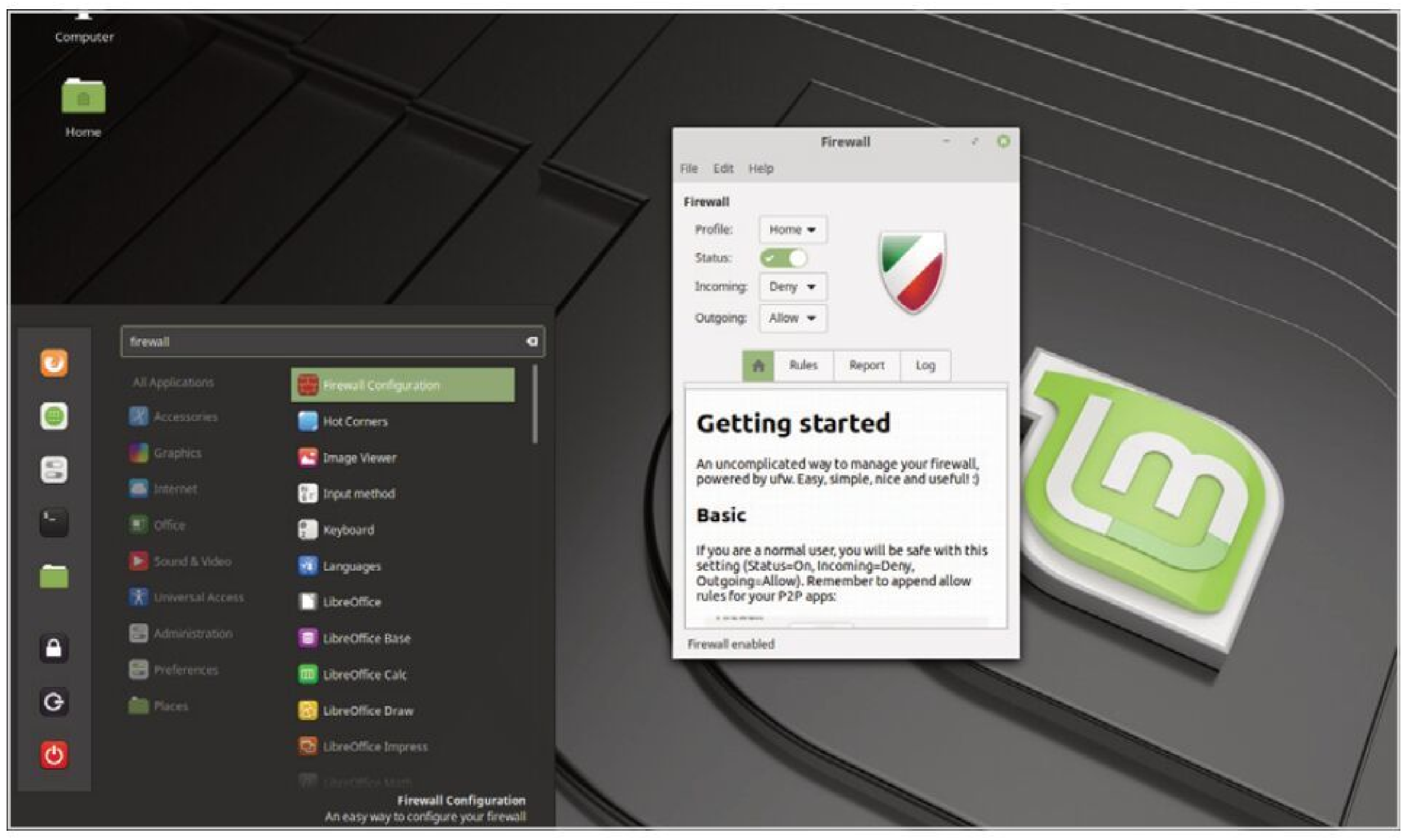
# Uncomment the next line to enable TCP/IP SYN cookies
# See http://lwn.net/Articles/277146/
# Note: This may impact IPv6 TCP sessions too
#net.ipv4.tcp_syncookies=1

# Uncomment the next line to enable packet forwarding for IPv4
#net.ipv4.ip_forward=1

# Uncomment the next line to enable packet forwarding for IPv6
#  Enabling this option disables Stateless Address Autoconfiguration
#  based on Router Advertisements for this host
#net.ipv6.conf.all.forwarding=1


###################################################################
# Additional settings - these settings can improve the network
# security of the host and prevent against some network attacks
# including spoofing attacks and man in the middle attacks through
# redirection. Some network environments, however, require that these
# settings are disabled so review and enable them as needed.
#
# Do not accept ICMP redirects (prevent MITM attacks)
#net.ipv4.conf.all.accept_redirects = 0
#net.ipv6.conf.all.accept_redirects = 0
# _or_
# Accept ICMP redirects only for gateways listed in our default
# gateway list (enabled by default)
# net.ipv4.conf.all.secure_redirects = 1
#
# Do not send ICMP redirects (we are not a router)
#net.ipv4.conf.all.send_redirects = 0
#
# Do not accept IP source route packets (we are not a router)
#net.ipv4.conf.all.accept_source_route = 0
#net.ipv6.conf.all.accept_source_route = 0
#
# Log Martian Packets
#net.ipv4.conf.all.log_martians = 1
#
# Decrease swap usage to a more reasonable level
vm.swappiness=10
```

**STEP 10** Security is always a concern in this modern digital age. While Linux Mint is a secure system, it’s advisable to always try and improve it. Click the Menu button and search for Firewall; click the Firewall Configuration icon and enter your password. In the Firewall window, click the Status slider to On.


Computer
Home
firewall
All Applications
Accessories
Graphics
Internet
Office
Sound & Video
Universal Access
Administration
Preferences
Places
Firewall Configuration
Hot Corners
Image Viewer
Input method
Keyboard
Languages
LibreOffice
LibreOffice Base
LibreOffice Calc
LibreOffice Draw
LibreOffice Impress
Firewall Configuration
An easy way to configure your firewall
Firewall
File Edit Help
Rules
Report
Log

Firewall

Profile: Home

Status: On

Incoming: Deny

Outgoing: Allow

**Getting started**

An uncomplicated way to manage your firewall, powered by ufw. Easy, simple, nice and useful! :)

**Basic**

If you are a normal user, you will be safe with this setting (Status=On, Incoming=Deny, Outgoing=Allow). Remember to append allow rules for your P2P apps:

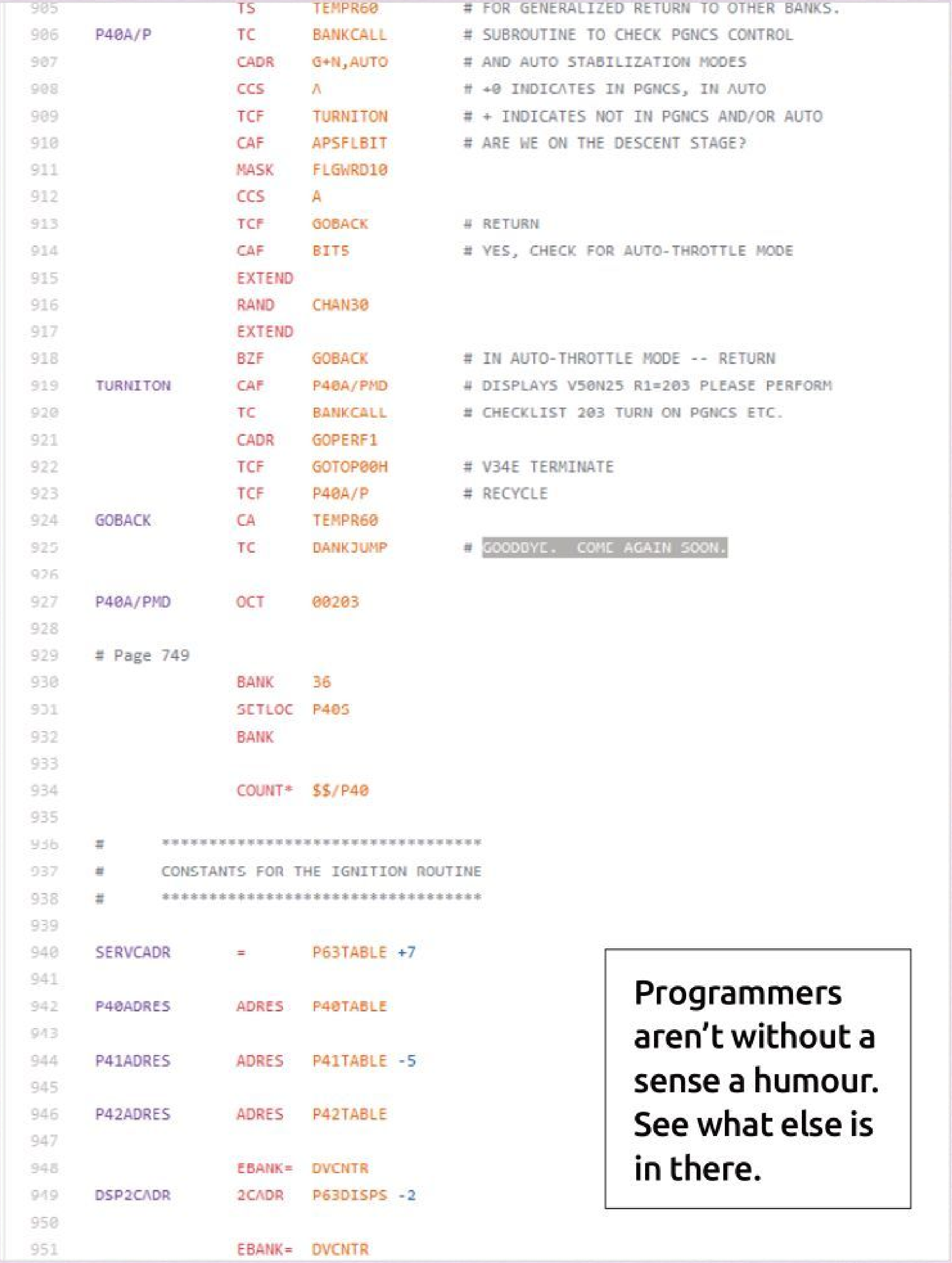
Firewall enabled

# Apollo 11

**DID YOU KNOW...** July 20th 1969 is remembered as a turning point in human history, when mankind first stepped on the moon. The software that helped the crew make that pivotal voyage didn't even exist at the time and had to be developed from scratch. Using a new method of storing programs called Rope Memory, the engineers at MIT Instrumentation Laboratory populated the memory with a special version of assembly.

Incredibly, that code is freely available to view on GitHub. Uploaded by a researcher in 2003, you can view the code by visiting **www.github.com/chrislgarry/Apollo-11/**. Look out for code snippets, such as Burn_Baby_Burn, in particular line 925 with the comment "Goodbye. Come again soon."

Have a look through, and see what else you can find.



```
905                 TS       TEMPR60         # FOR GENERALIZED RETURN TO OTHER BANKS.
906   P40A/P        TC       BANKCALL        # SUBROUTINE TO CHECK PGNCS CONTROL
907                 CADR     G+N,AUTO        # AND AUTO STABILIZATION MODES
908                 CCS      A               # +0 INDICATES IN PGNCS, IN AUTO
909                 TCF      TURNITON        # + INDICATES NOT IN PGNCS AND/OR AUTO
910                 CAF      APSFLBIT        # ARE WE ON THE DESCENT STAGE?
911                 MASK     FLGWRD10
912                 CCS      A
913                 TCF      GOBACK          # RETURN
914                 CAF      BIT5            # YES, CHECK FOR AUTO-THROTTLE MODE
915                 EXTEND
916                 RAND     CHAN30
917                 EXTEND
918                 BZF      GOBACK          # IN AUTO-THROTTLE MODE -- RETURN
919   TURNITON      CAF      P40A/PMD        # DISPLAYS V50N25 R1=203 PLEASE PERFORM
920                 TC       BANKCALL        # CHECKLIST 203 TURN ON PGNCS ETC.
921                 CADR     GOPERF1
922                 TCF      GOTOP00H        # V34E TERMINATE
923                 TCF      P40A/P          # RECYCLE
924   GOBACK        CA       TEMPR60
925                 TC       BANKJUMP        # GOODBYE.  COME AGAIN SOON.
926
927   P40A/PMD      OCT      00203
928
929   # Page 749
930                 BANK     36
931                 SETLOC   P40S
932                 BANK
933
934                 COUNT*   $$/P40
935
936   #      **********************************
937   #      CONSTANTS FOR THE IGNITION ROUTINE
938   #      **********************************
939
940   SERVCADR      =        P63TABLE +7
941
942   P40ADRES      ADRES    P40TABLE
943
944   P41ADRES      ADRES    P41TABLE -5
945
946   P42ADRES      ADRES    P42TABLE
947
948                 EBANK=   DVCNTR
949   DSP2CADR      2CADR    P63DISPS -2
950
951                 EBANK=   DVCNTR
```

Programmers aren't without a sense a humour. See what else is in there.

One giant leap for mankind, and coding.

Credit: Apollo 11/NASA

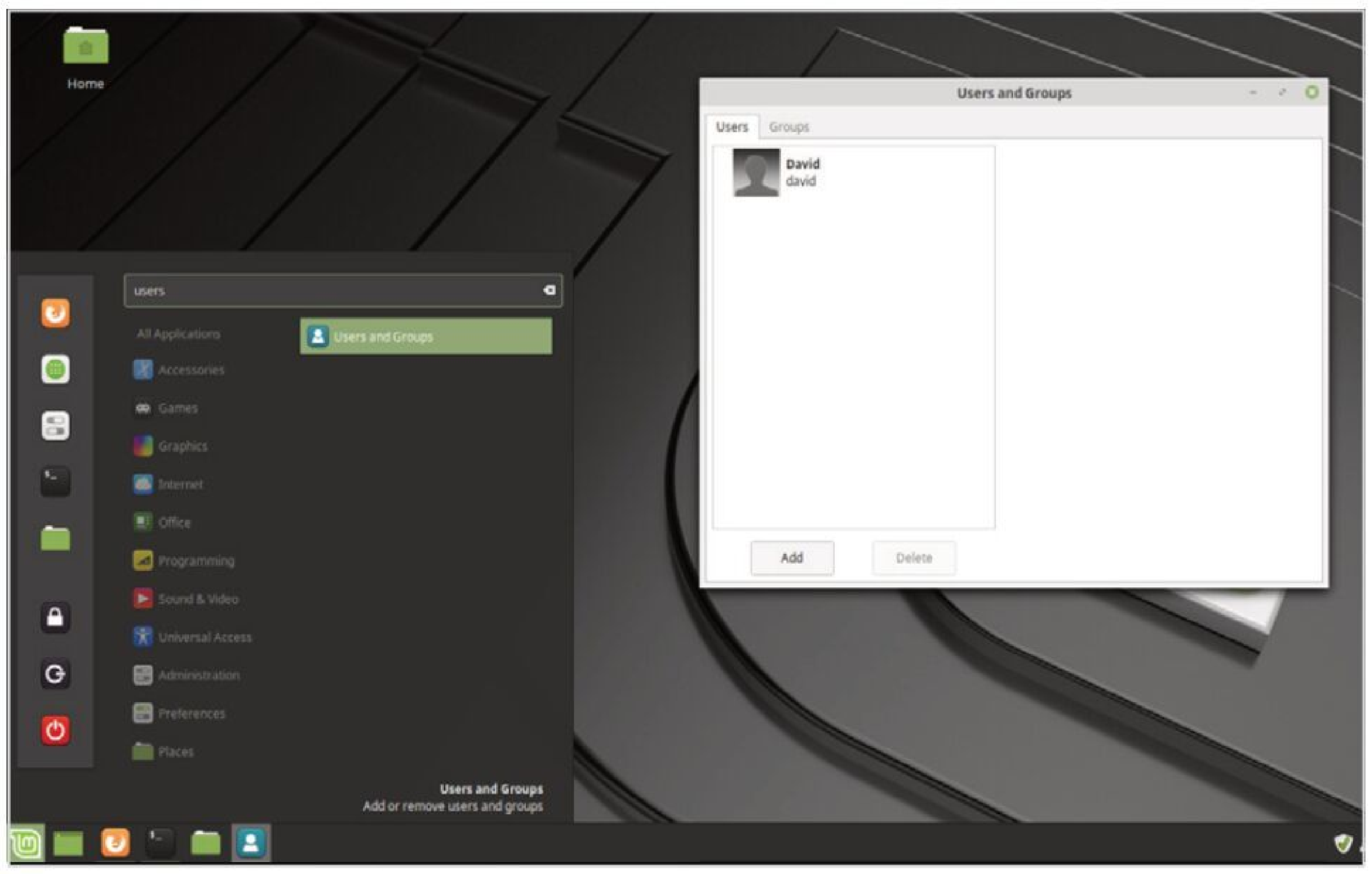
# Creating Users

When you first install Linux Mint it is configured for use with a single user. While sharing a user account with the entire family is fine, there may come a time when you need to create separate users with their own unique Home folders.

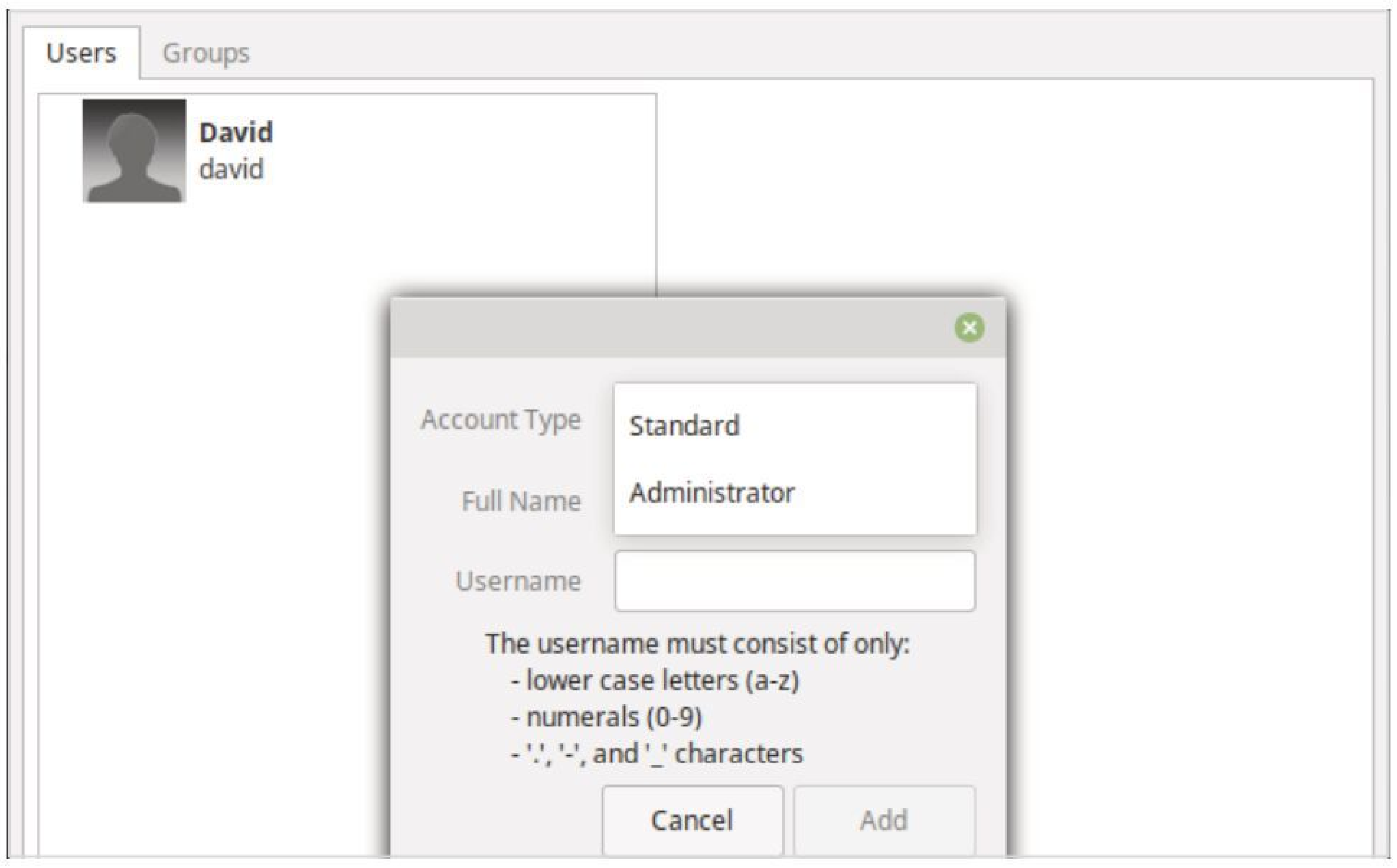
## NEW USERS

**Having different users means each user has access to his or hers own areas on the system. Documents, pictures, videos and so on are separate, as with multiple users on other operating systems.**

**STEP 1** Click on the Linux Mint Menu and type 'users' to begin searching for the relevant console. From the search results, choose Users and Groups and enter your password. The Users and Groups console is quite basic looking, and thankfully easy to use. At first, you can just see your own username from when you installed Linux Mint.



**STEP 2** To add a new user, click the Add button at the bottom of the console. There are two types of user you can create, Standard and Administrator. Unless the new user has need to install new apps or access parts of the file system beyond their Home folder, then opt for the Standard account type. Otherwise, use the Administrator account type.



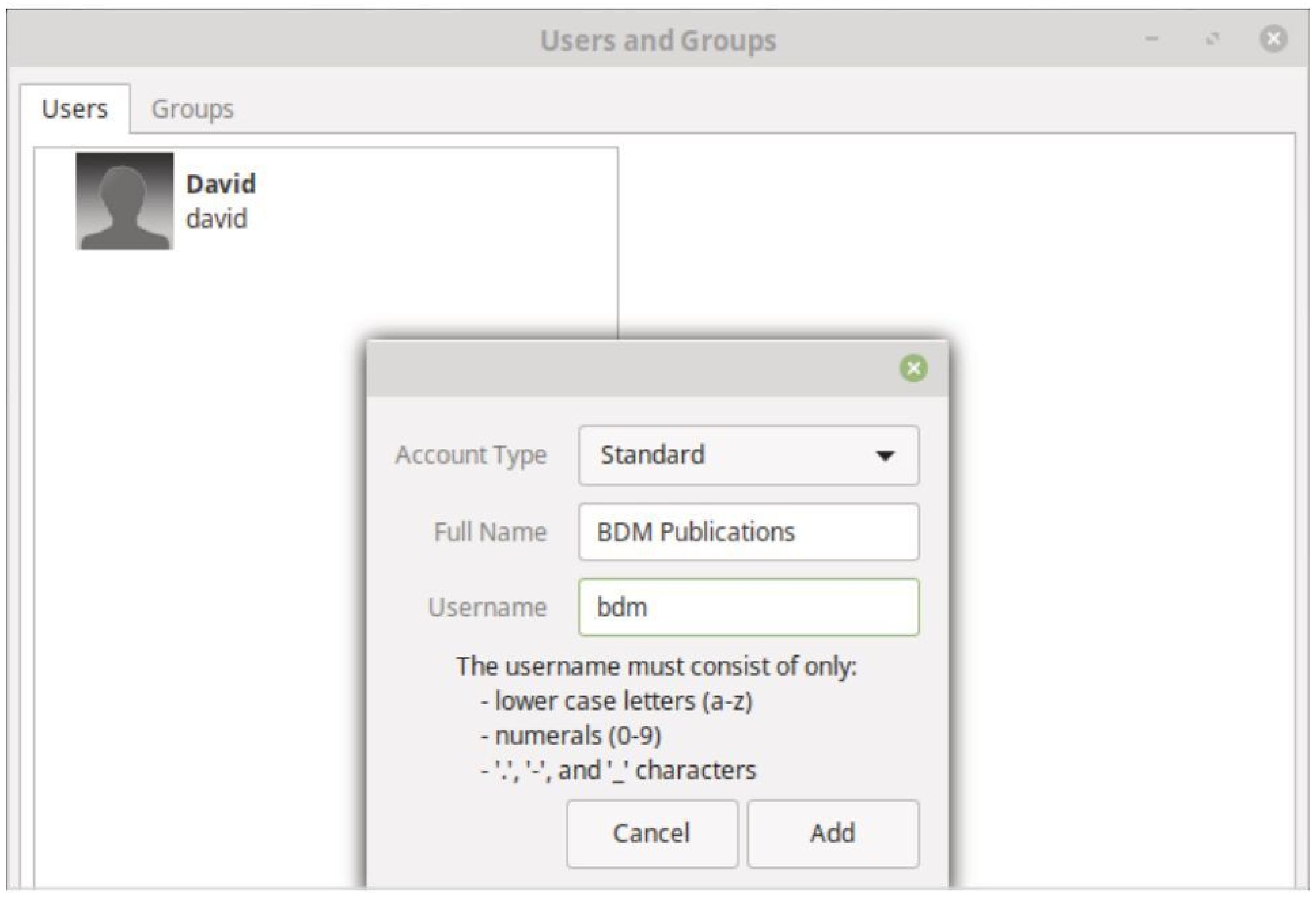
Account Type: Standard / Administrator

Full Name

Username

The username must consist of only:
- lower case letters (a-z)
- numerals (0-9)
- '.', '-', and '_' characters

**STEP 3** Enter the new user's Full Name, followed by the Username they need when logging into Linux Mint. Make sure the username is all in lower case, a-z and 0-9 characters only. You can have full stops, underscores or hyphens if you wish. Click the Add button when you're ready to continue.



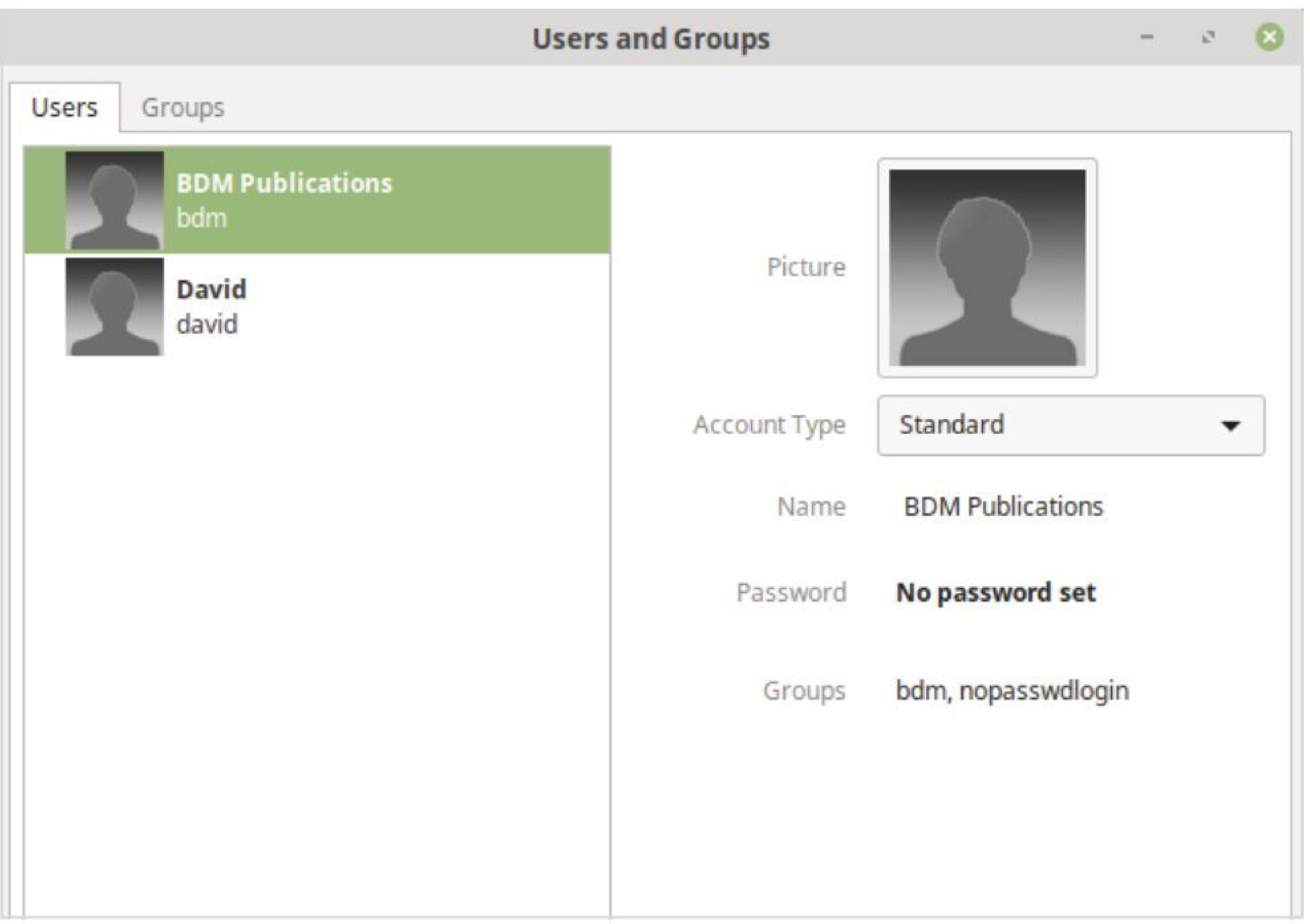
Account Type: Standard

Full Name: BDM Publications

Username: bdm

The username must consist of only:
- lower case letters (a-z)
- numerals (0-9)
- '.', '-', and '_' characters

**STEP 4** The new user appears in the list of current Linux Mint users, in alphabetical order. At present, there's no password set so click the user in the list of current users, then click the No Password Set option under the user's username.



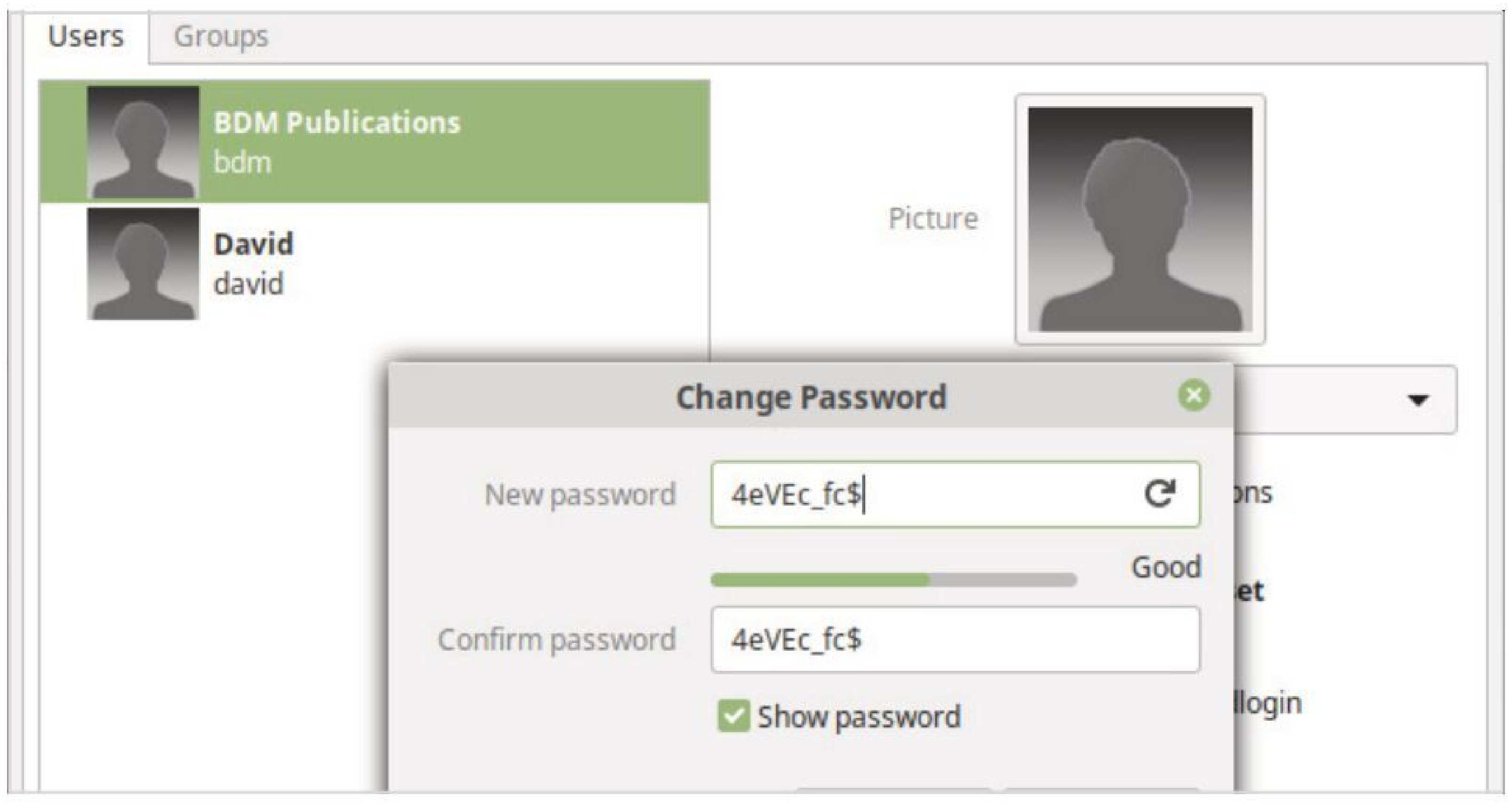
Account Type: Standard

Name: BDM Publications

Password: No password set

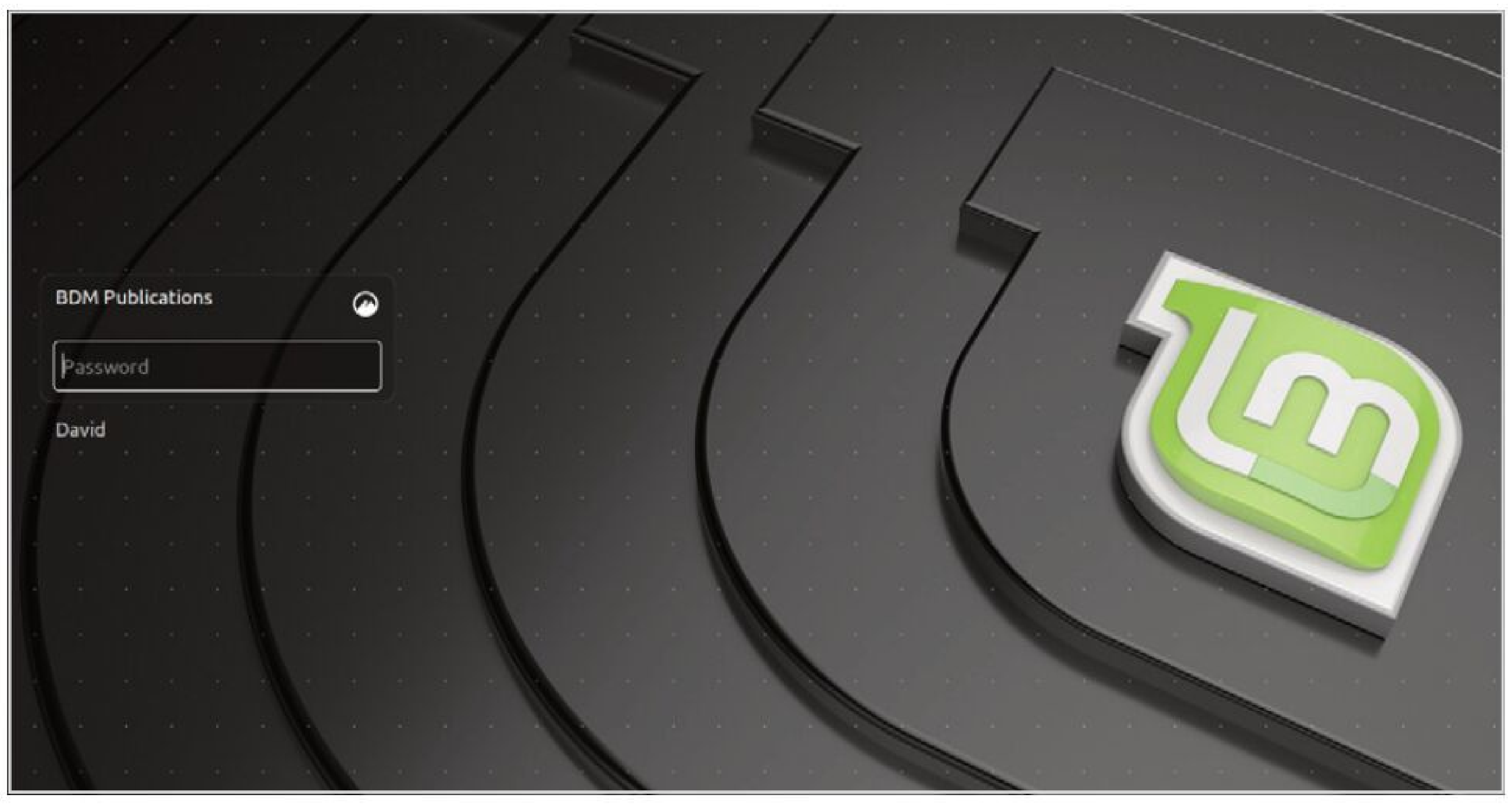
Groups: bdm, nopasswdlogin

**STEP 5** You can now enter a password for the new user or click the curled arrow at the end of the New Password text box to generate a password for you, as well as displaying it. Naturally, it's a good idea to come up with as strong a password as possible. When you're done, click the Change button.

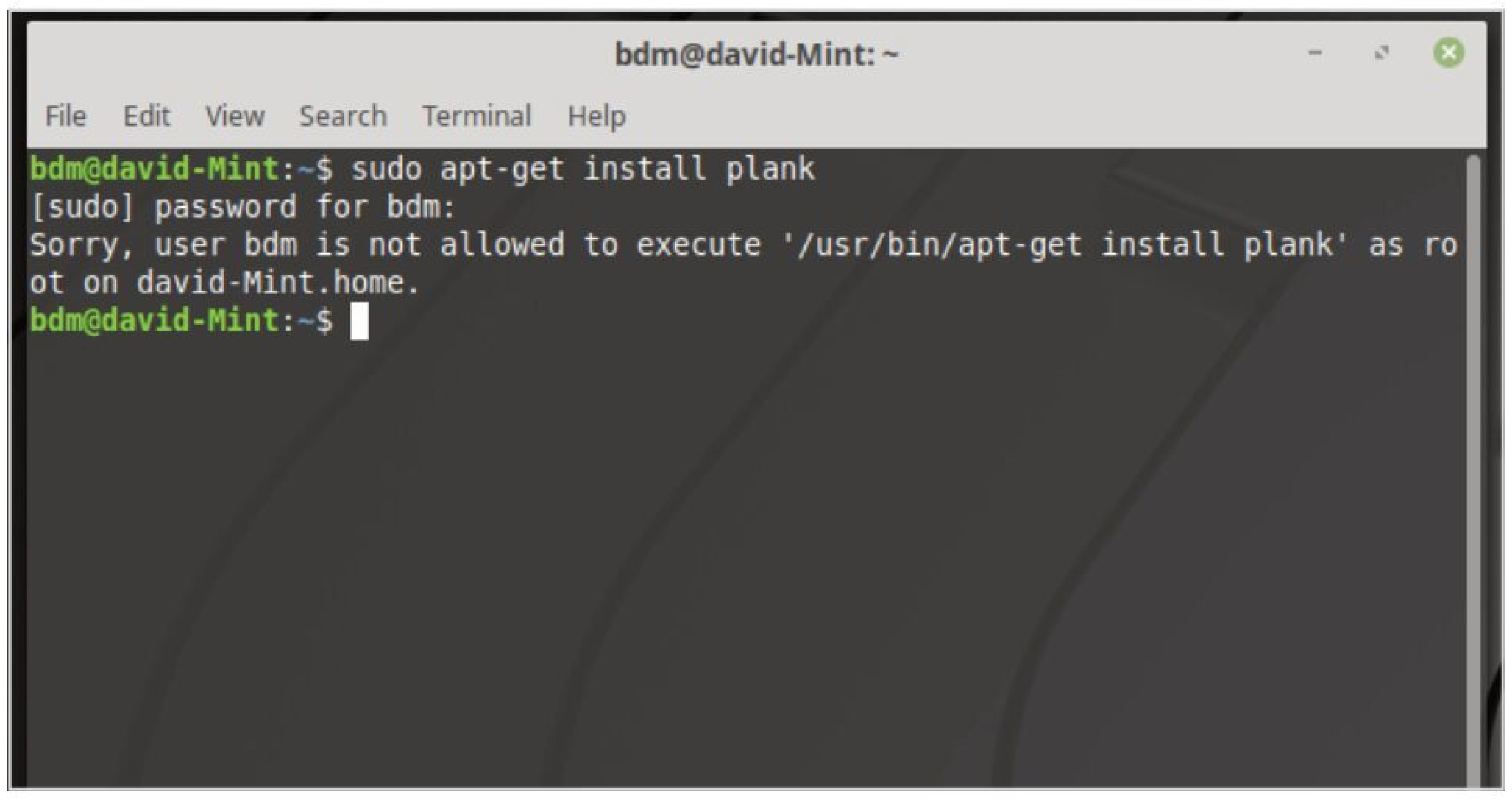

Users
Groups
BDM Publications
bdm
David
david
Picture
Change Password
Good
Show password

New password: 4eVEc_fc$
Confirm password: 4eVEc_fc$
☑ Show password

**STEP 6** You can close the Users and Groups console window now, as the new user has been created. If you click the Mint Menu, followed by Logout, you are presented with the Mint Login Manager. The new user is now present in the list of currently available users. Click on him/her to log them in.

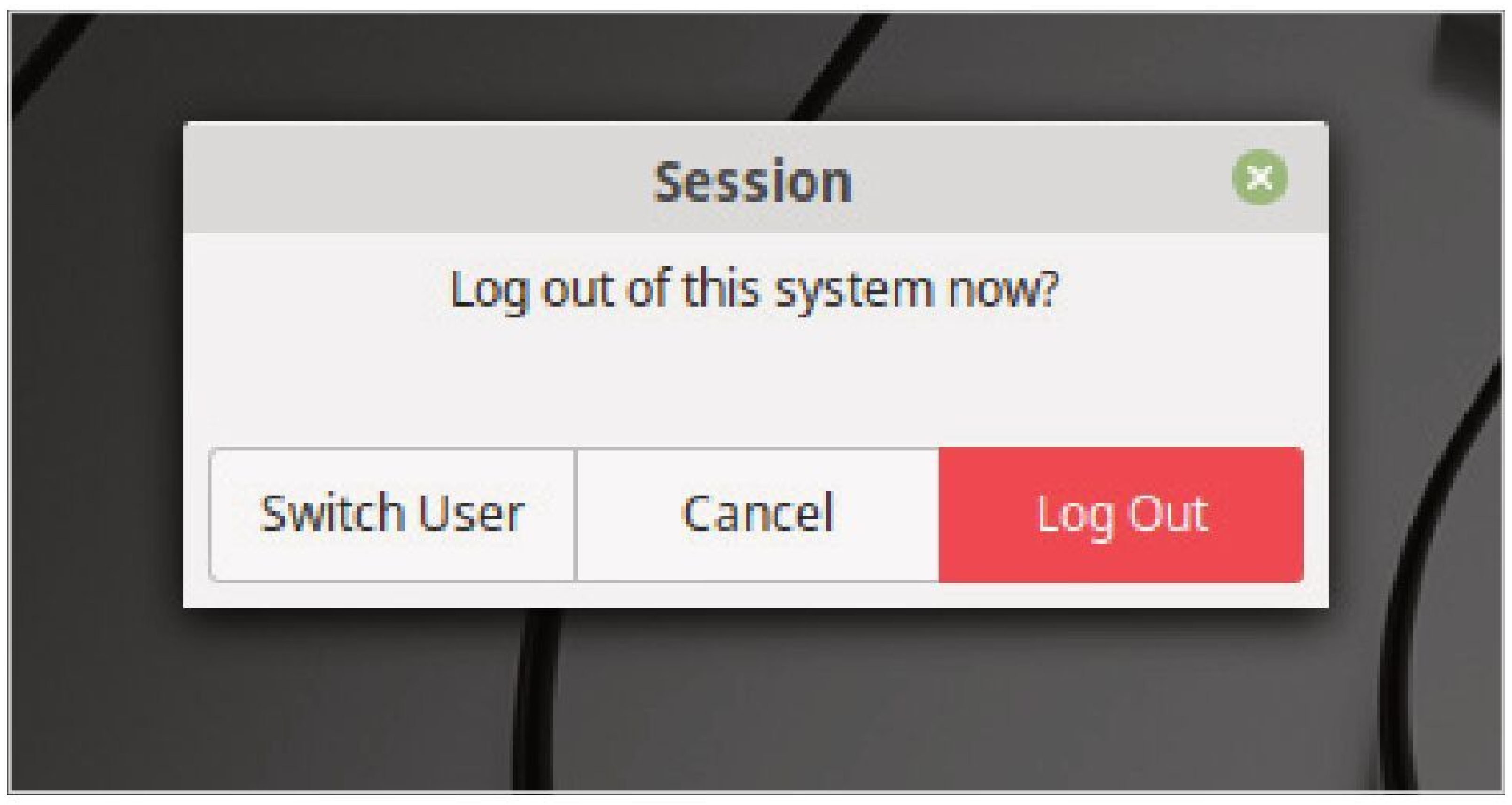

BDM Publications
Password
David

**STEP 7** Once logged in the new user is required to set up their own desktop wallpaper, icons, Panel, Menu and so on. Depending on what Account Type you set up for them, Standard or Administrator, they won't be able to install any new apps. This screenshot is from a Standard user account type.


bdm@david-Mint: ~
File Edit View Search Terminal Help

```
bdm@david-Mint:~$ sudo apt-get install plank
[sudo] password for bdm:
Sorry, user bdm is not allowed to execute '/usr/bin/apt-get install plank' as ro
ot on david-Mint.home.
bdm@david-Mint:~$
```

**STEP 8** You can create as many new accounts as you need and you're able to switch between them when required. It's best to have just one account that's capable of installing new software, that way you can keep track of what's on your system.

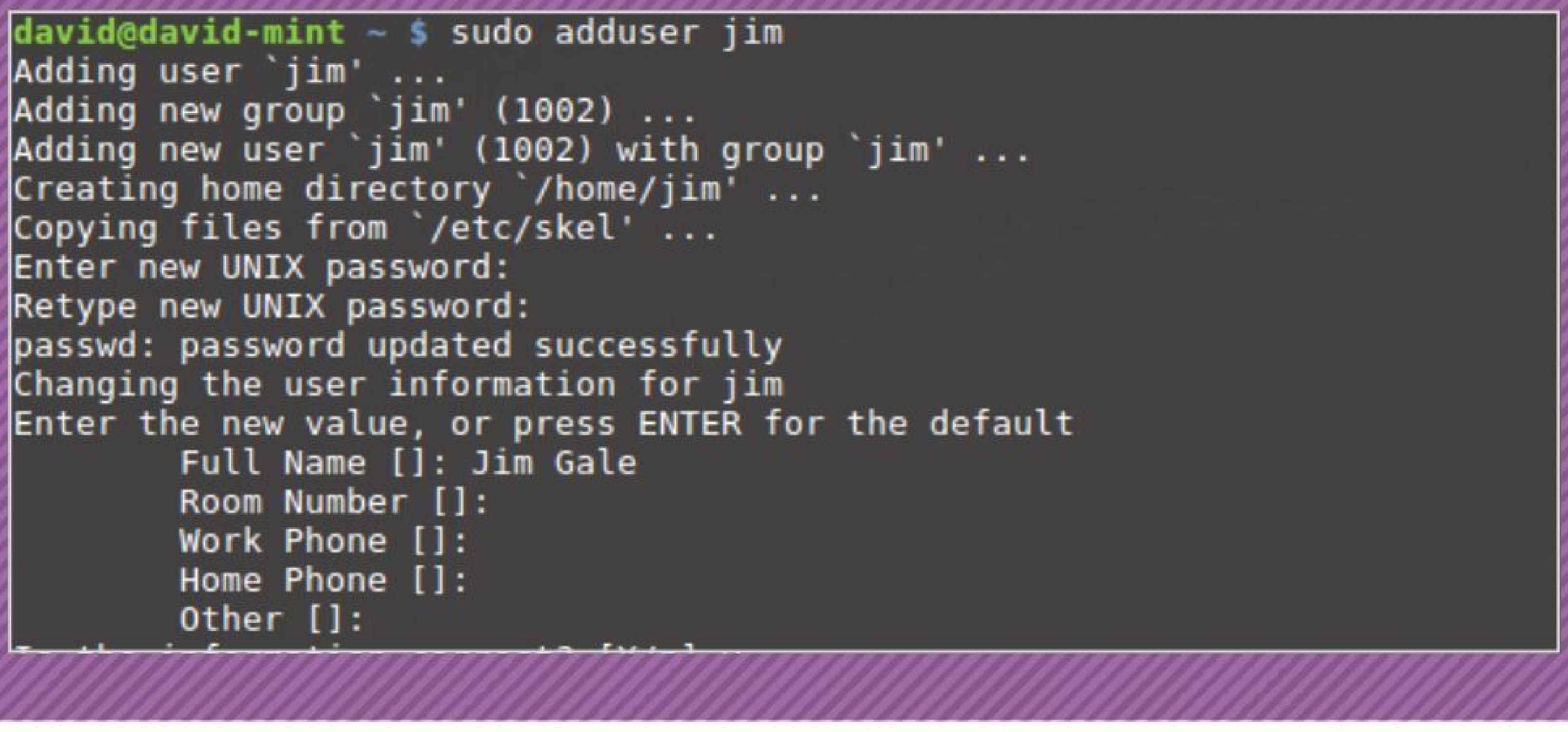

Session
Switch User
Cancel
Log Out

Log out of this system now?

## COMMAND LINE ACCOUNTS

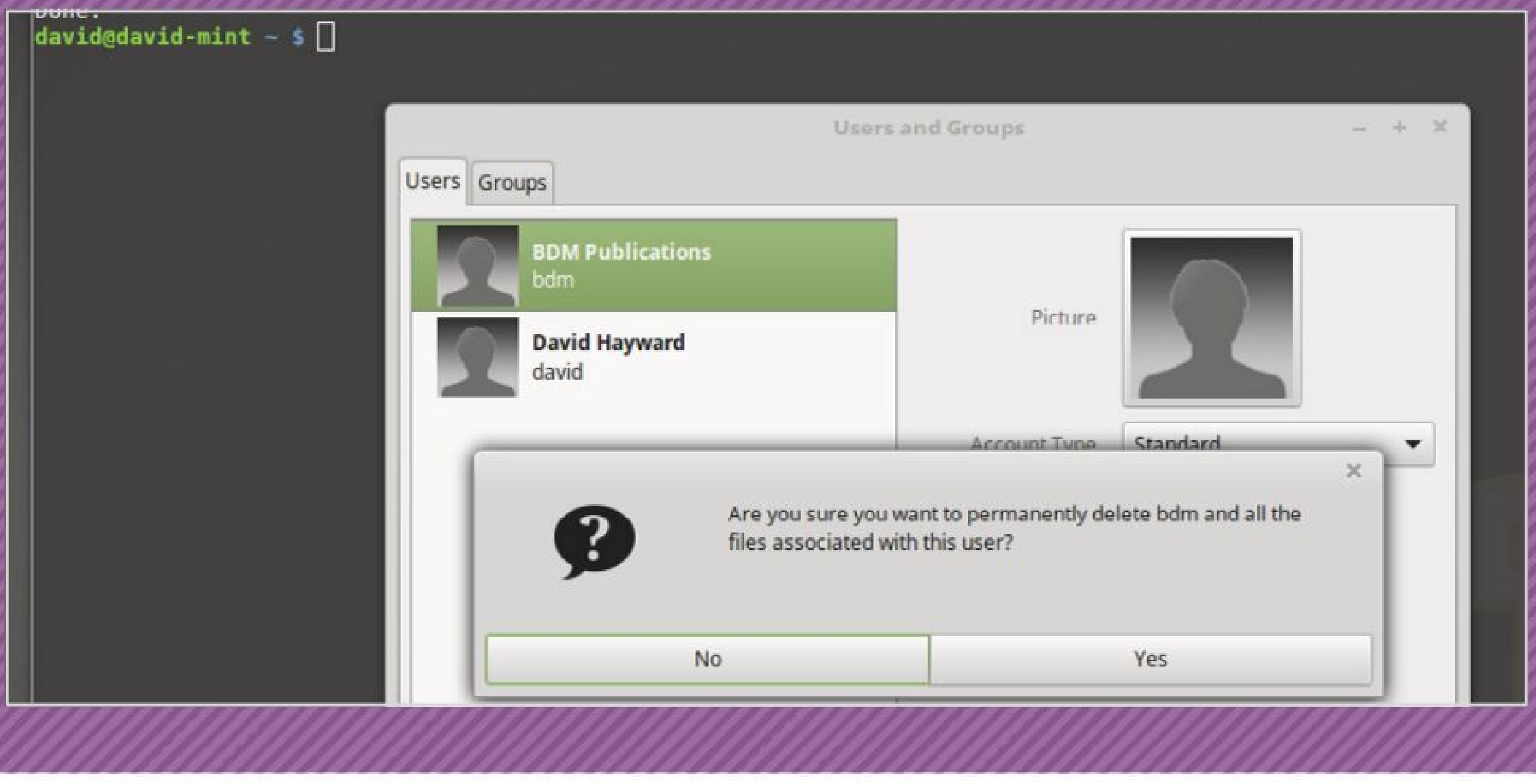
**Just as you'd expect, you can also create a new user within the command Line. Open up a Terminal session under the main (yours) Administrator account.**

**STEP 1** The process for adding a new user from the command line is relatively simple. To begin with, type: `sudo adduser <username>`, where `<username>` is the new user's login name. You're then asked to create a new password for the user, along with their full name and other details. Click y to confirm the details and create the user account.



```
david@david-mint ~ $ sudo adduser jim
Adding user `jim' ...
Adding new group `jim' (1002) ...
Adding new user `jim' (1002) with group `jim' ...
Creating home directory `/home/jim' ...
Copying files from `/etc/skel' ...
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
Changing the user information for jim
Enter the new value, or press ENTER for the default
        Full Name []: Jim Gale
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
```

**STEP 2** You can check the details and account type for the new user from within the Users and Groups console. If you want to delete a user from Mint, you can either enter: `sudo deluser <username>` in the Terminal or click the Delete button in Users and Groups.



```
david@david-mint ~ $
```

Users and Groups
Users
Groups
BDM Publications
bdm
David Hayward
david
Picture
No
Yes

Account Type: Standard

Are you sure you want to permanently delete bdm and all the files associated with this user?

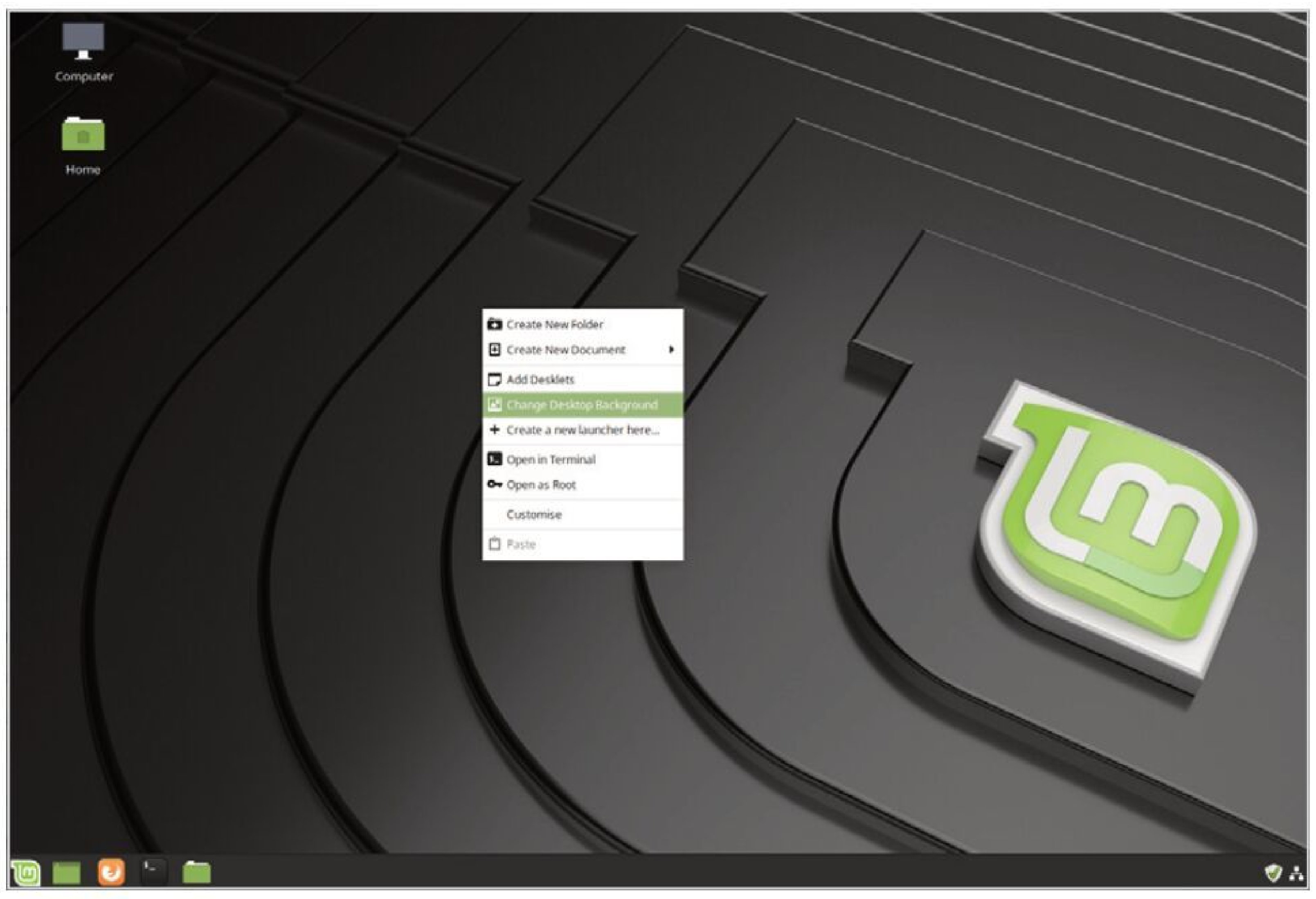
# Customising the Desktop

Customising the operating system desktop is one way to make it your own: a personalised workspace that is there to help you work, inspire you or feature the company logo. Whatever your reasons for having your own desktop, here's how it's done.

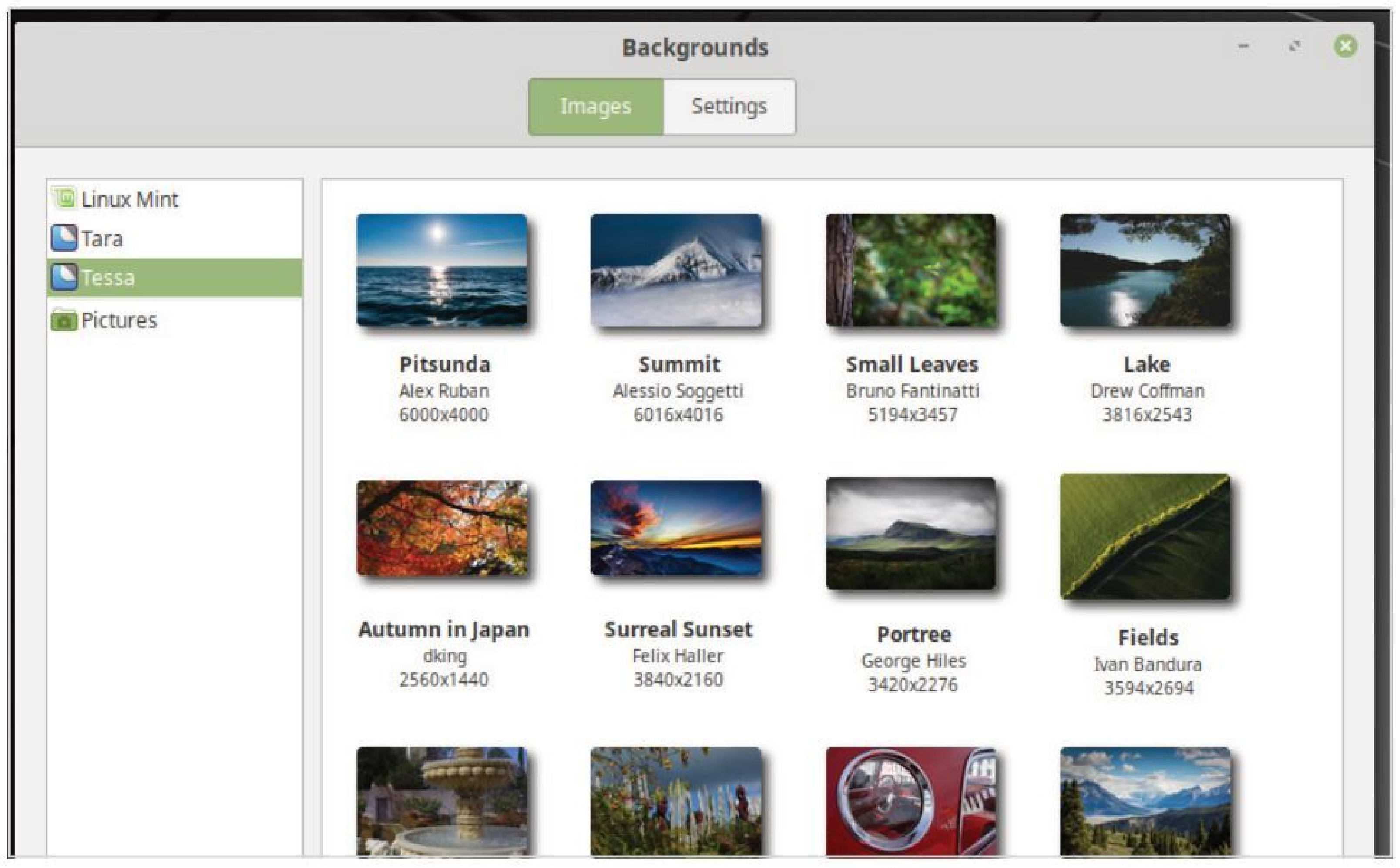
## YOUR DESKTOP

**Linux is probably one of the customisable operating systems there is. With just a few tweaks, one or two extras installed and some imagination, you can create something incredible.**

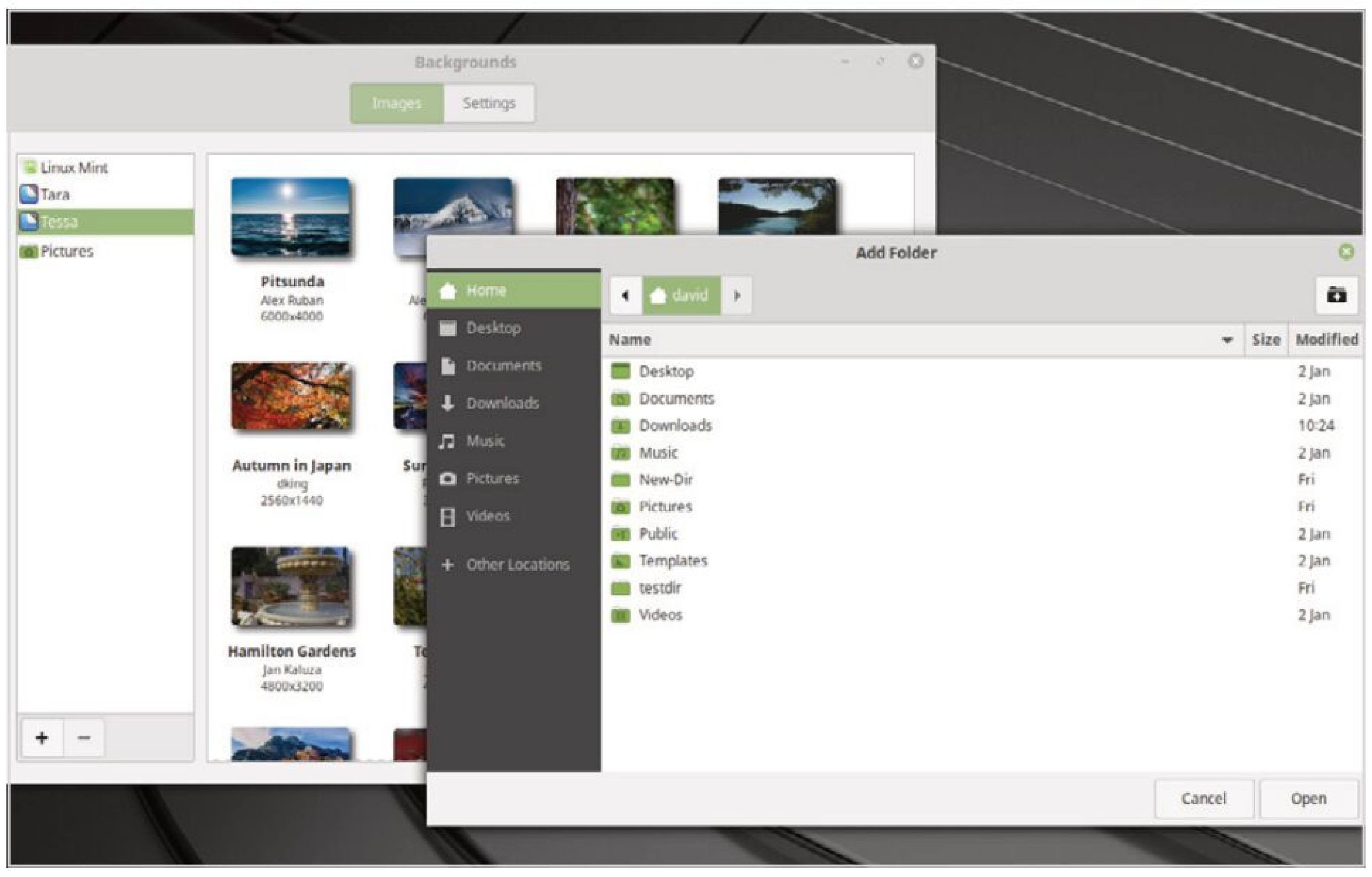
**STEP 1** The first aspect of desktop customisation is to change the wallpaper. Right-click the desktop and choose Change Desktop Background. This opens the Backgrounds app in Linux Mint; remember, other distros may present their background, wallpaper selection tools differently.


Computer
Home
Create New Folder
Create New Document
Add Desklets
Change Desktop Background
Create a new launcher here...
Open in Terminal
Open as Root
Customise
Paste

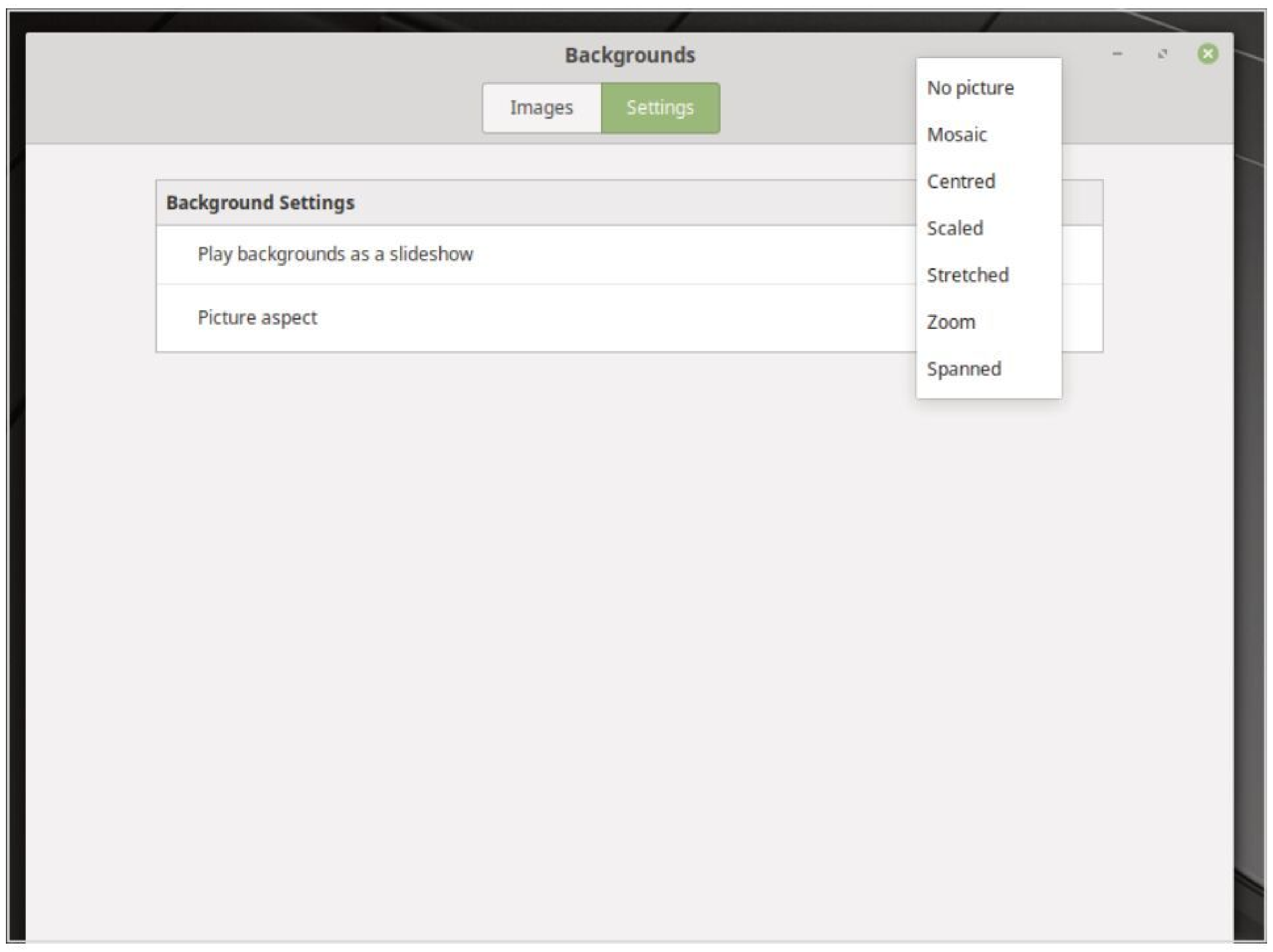
**STEP 2** More recent versions of Linux Mint display available backgrounds depending on the version the user is running. You normally get three categories followed by a fourth, Pictures, which is separated from the others. The Pictures option is different because it reads the image content from the Pictures folder in your Home area.


Backgrounds
Images
Settings
Linux Mint
Tara
Tessa
Pictures
Pitsunda
Alex Ruban
6000x4000
Summit
Alessio Soggetti
6016x4016
Small Leaves
Bruno Fantinatti
5194x3457
Lake
Drew Coffman
3816x2543
Autumn in Japan
dking
2560x1440
Surreal Sunset
Felix Haller
3840x2160
Portree
George Hiles
3420x2276
Fields
Ivan Bandura
3594x2694

**STEP 3** You just need to click the available images, from any of the locations provided to have them install as the desktop wallpaper. Incidentally, if you have images stored in another location on your system or network, you can add them by clicking on the Plus symbol at the bottom of the Backgrounds console, using the file manager to locate them.

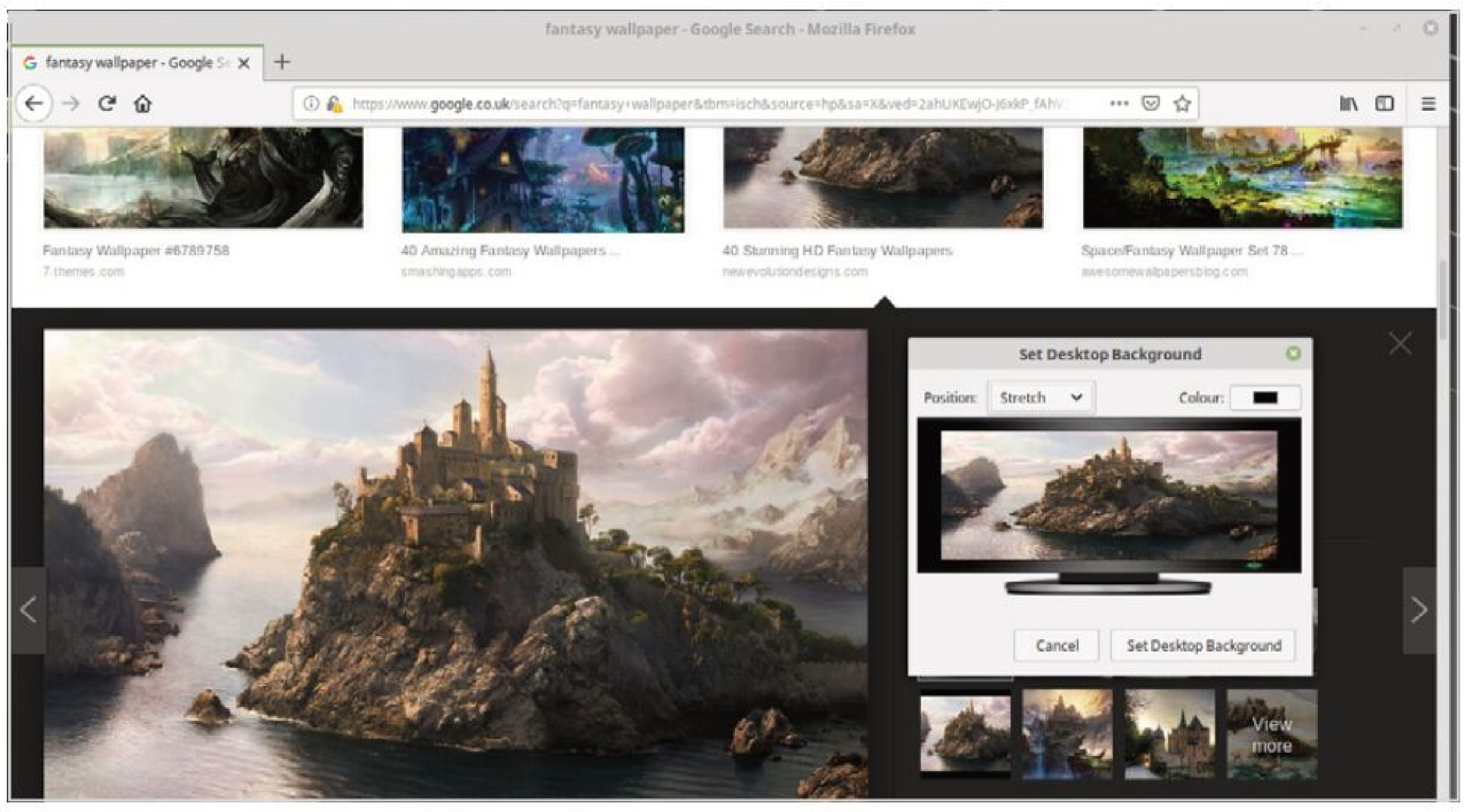

Backgrounds
Images
Settings
Linux Mint
Tara
Tessa
Pictures
Pitsunda
Alex Ruban
6000x4000
Autumn in Japan
dking
2560x1440
Hamilton Gardens
Jan Kaluza
4800x3200
Add Folder
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Other Locations
david
Name
Size
Modified
Desktop 2 Jan
Documents 2 Jan
Downloads 10:24
Music 2 Jan
New-Dir Fri
Pictures Fri
Public 2 Jan
Templates 2 Jan
testdir Fri
Videos 2 Jan
Cancel
Open

**STEP 4** By clicking on the Settings tab you can, instead, play numerous images as a slideshow or change the aspect of the wallpapers to a variety of choices.


Backgrounds
Images
Settings
Background Settings
Play backgrounds as a slideshow
Picture aspect
No picture
Mosaic
Centred
Scaled
Stretched
Zoom
Spanned

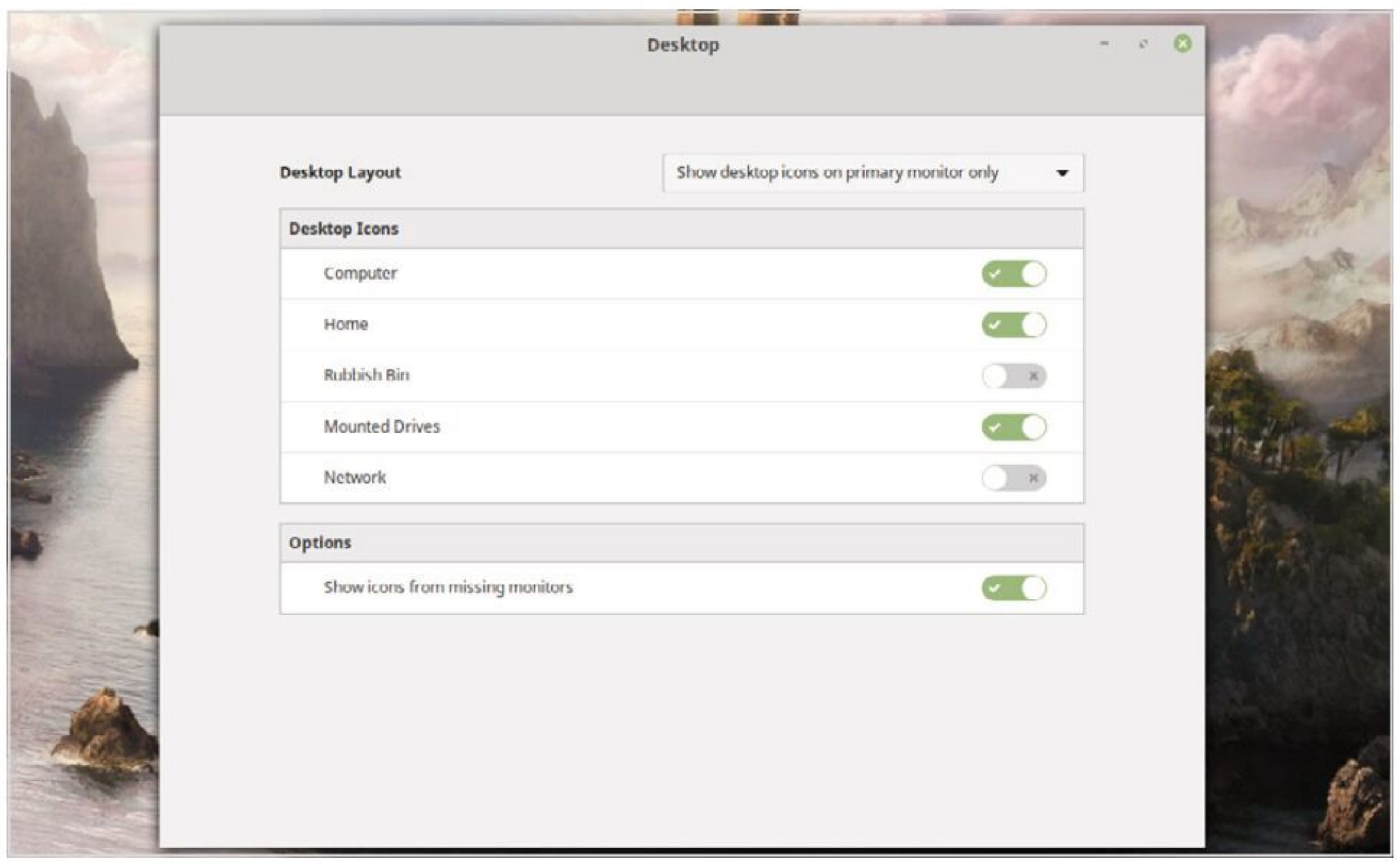
## STEP 5

If none of the available wallpapers take your fancy, open a browser and search for the type of background image you prefer. When you've found the image you want as the desktop wallpaper, right-click it and choose Set As Desktop Background from the list of options. When the Set Desktop Background console open, click the Set Desktop Background button.


fantasy wallpaper - Google Search - Mozilla Firefox
Set Desktop Background
Position: Stretch
Colour:
Cancel
Set Desktop Background
View more

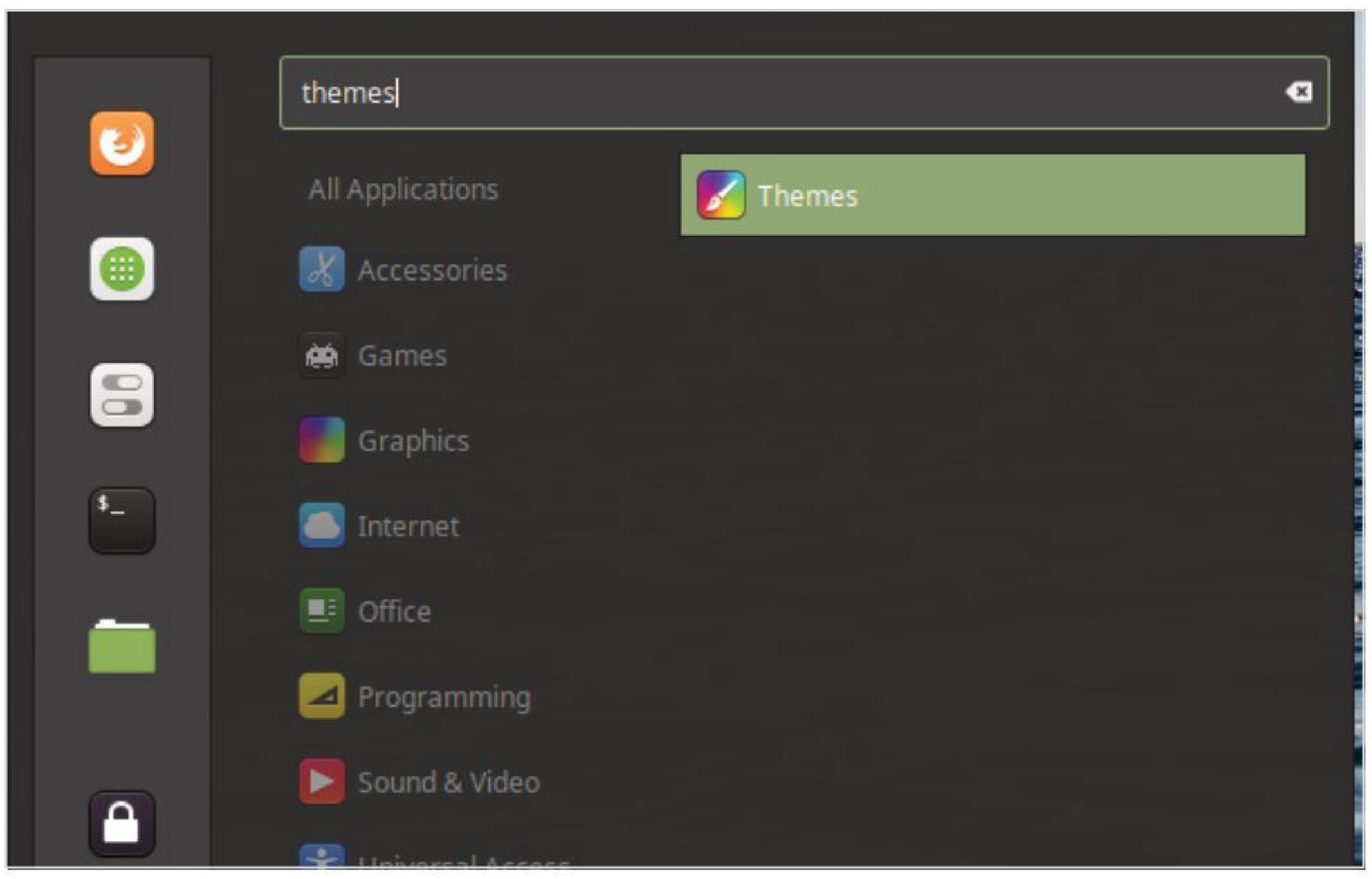
## STEP 6

Click the Menu button and search for 'desktop' and click the Desktop Settings result. The Desktop console allows you to pick the layout, desktop icons and options for multi-monitor support you want. You can experiment with the options for the best setup, according to your personal tastes.


Desktop
Desktop Layout
Show desktop icons on primary monitor only
Desktop Icons
Computer
Home
Rubbish Bin
Mounted Drives
Network
Options
Show icons from missing monitors

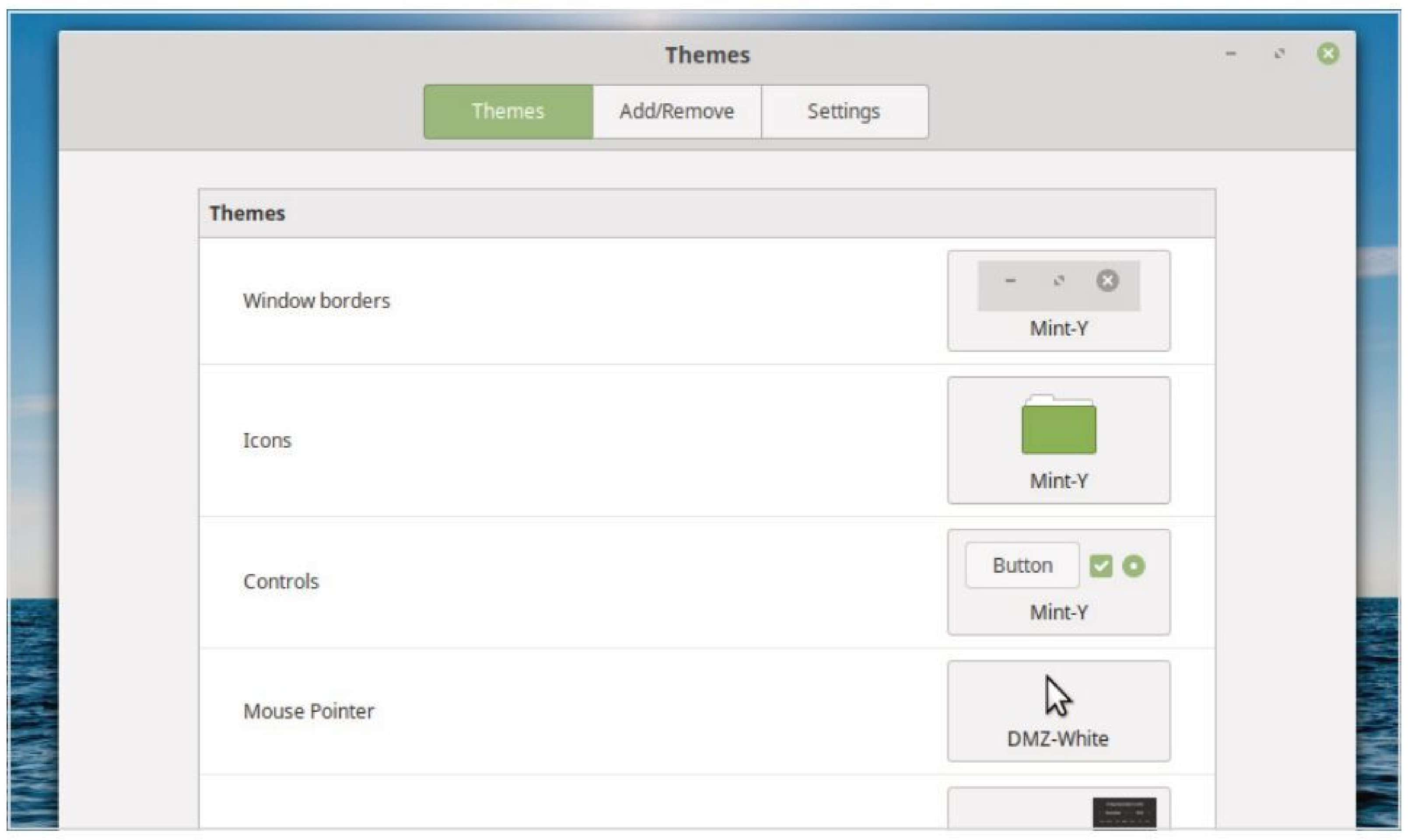
## STEP 7

In addition to changing the desktop wallpaper, and how the icons are displayed, you can also alter the overall theme for Linux Mint. From the Mint Menu, search for 'themes' and click the Themes app as it appears in the search results.


themes
All Applications
Themes
Accessories
Games
Graphics
Internet
Office
Programming
Sound & Video
Universal Access

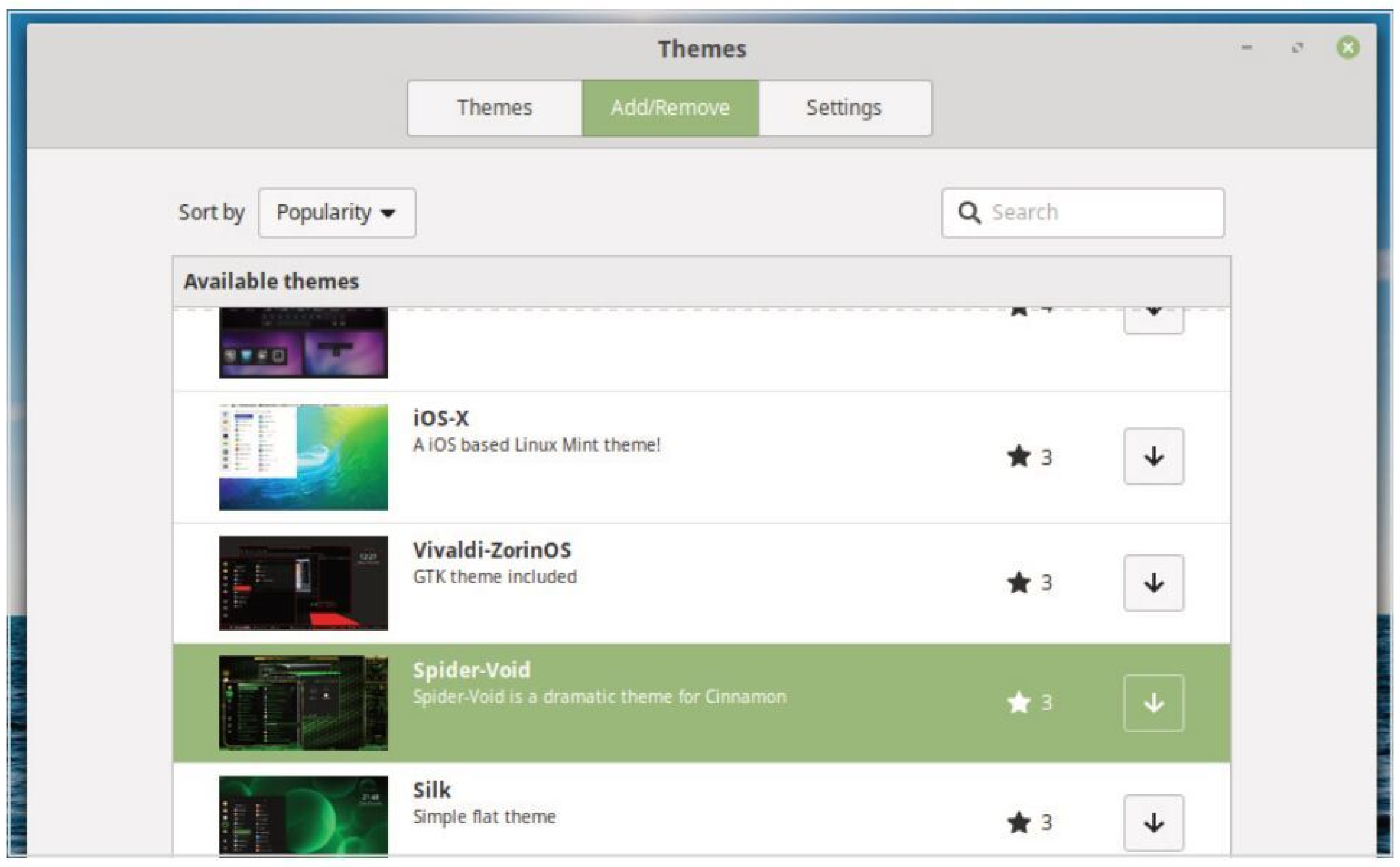
## STEP 8

Themes allows you to change the way certain aspects of the Mint desktop look: Window Borders, Icons, Controls, Mouse Pointer and Desktop. In the Settings tab you can extend the options with a few on/off slider buttons, too.


Themes
Themes
Add/Remove
Settings
Themes
Window borders
Mint-Y
Icons
Mint-Y
Controls
Button
Mint-Y
Mouse Pointer
DMZ-White

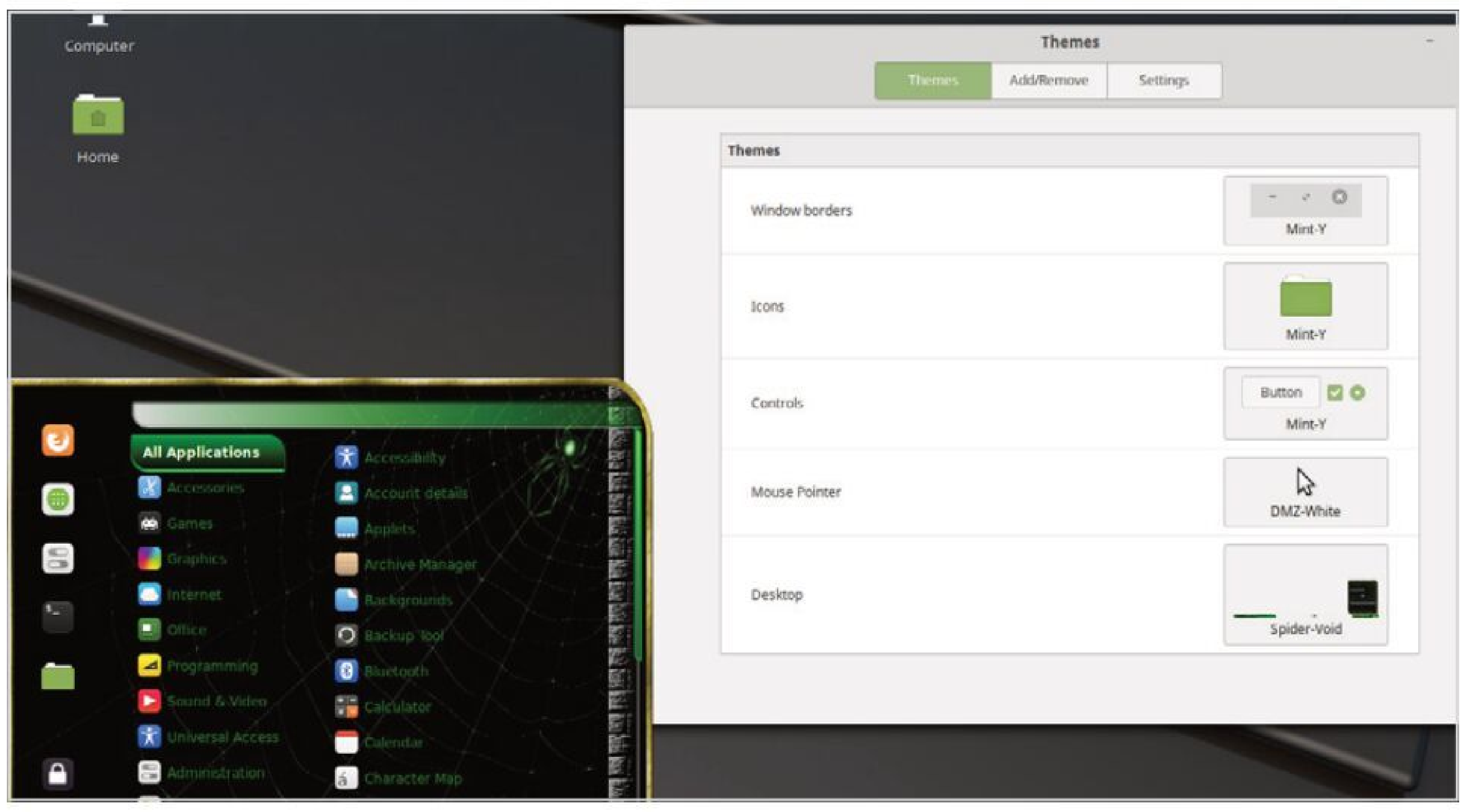
## STEP 9

If you click on the Add/remove button in the centre of the three available options, you can choose the default view from a number of preinstalled themes. Click the theme you want, then click the Install (downward-pointing arrow) button to enable it.


Themes
Themes
Add/Remove
Settings
Sort by
Popularity
Search
Available themes
iOS-X
A iOS based Linux Mint theme!
3
Vivaldi-ZorinOS
GTK theme included
3
Spider-Void
Spider-Void is a dramatic theme for Cinnamon
3
Silk
Simple flat theme
3

## STEP 10

Click back on Themes, then Desktop and you can locate the newly installed theme and apply to your desktop. Any installed Themes can also be uninstalled via the Add/Remove button. It's worth spending some time personalising your desktop how you want it and there are some incredible themes available too.


Computer
Home
Themes
Themes
Add/Remove
Settings
Window borders
Mint-Y
Icons
Mint-Y
Controls
Button
Mint-Y
Mouse Pointer
DMZ-White
Desktop
Spider-Void
All Applications

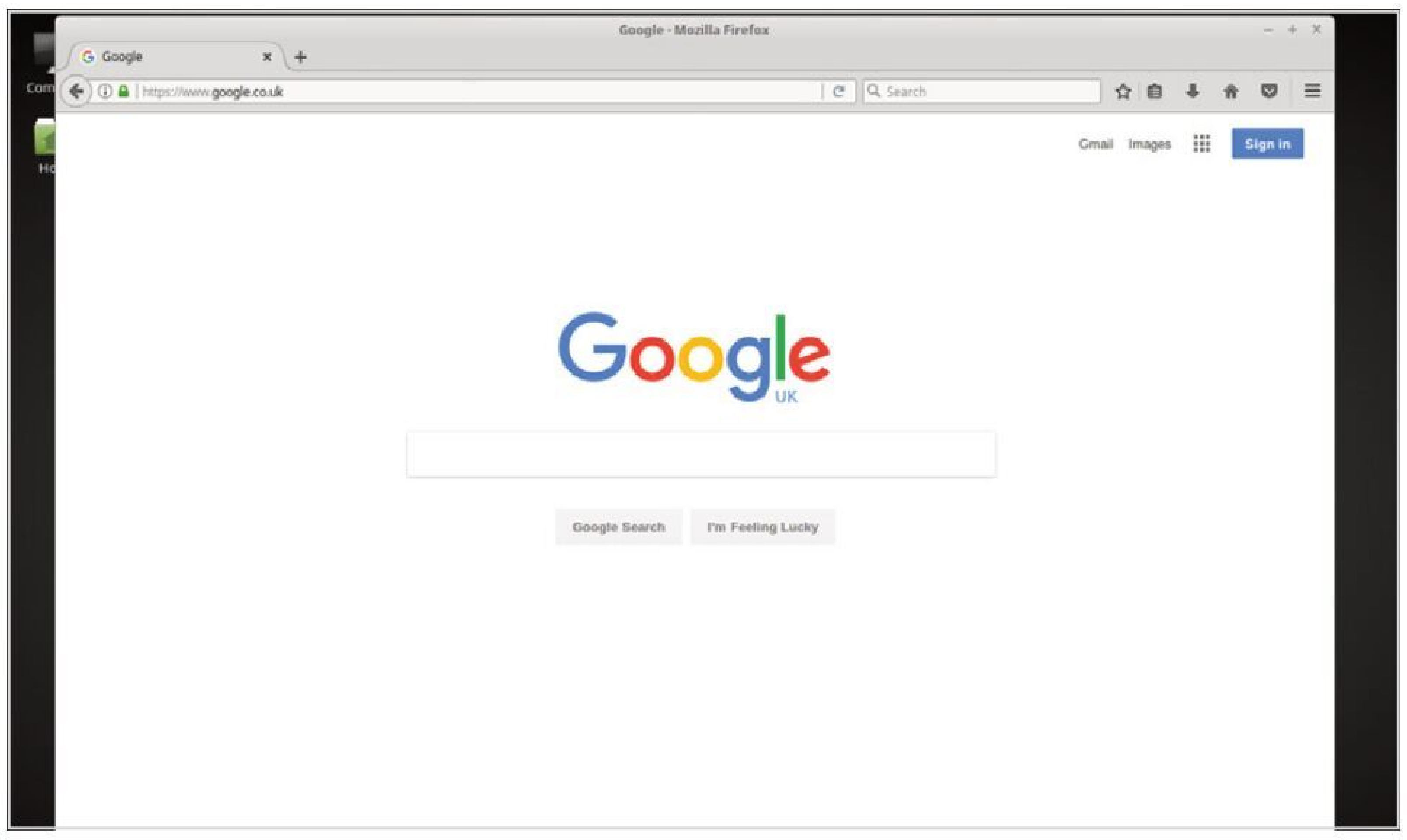
# Becoming Anonymous Online

The digital age has led to many great advances in communications; however, it has also brought on a new age of spying and snooping. Most of us are no strangers to the frequent news stories of governments, secret organisations and underground hackers breaking our privacy but how can you combat this?

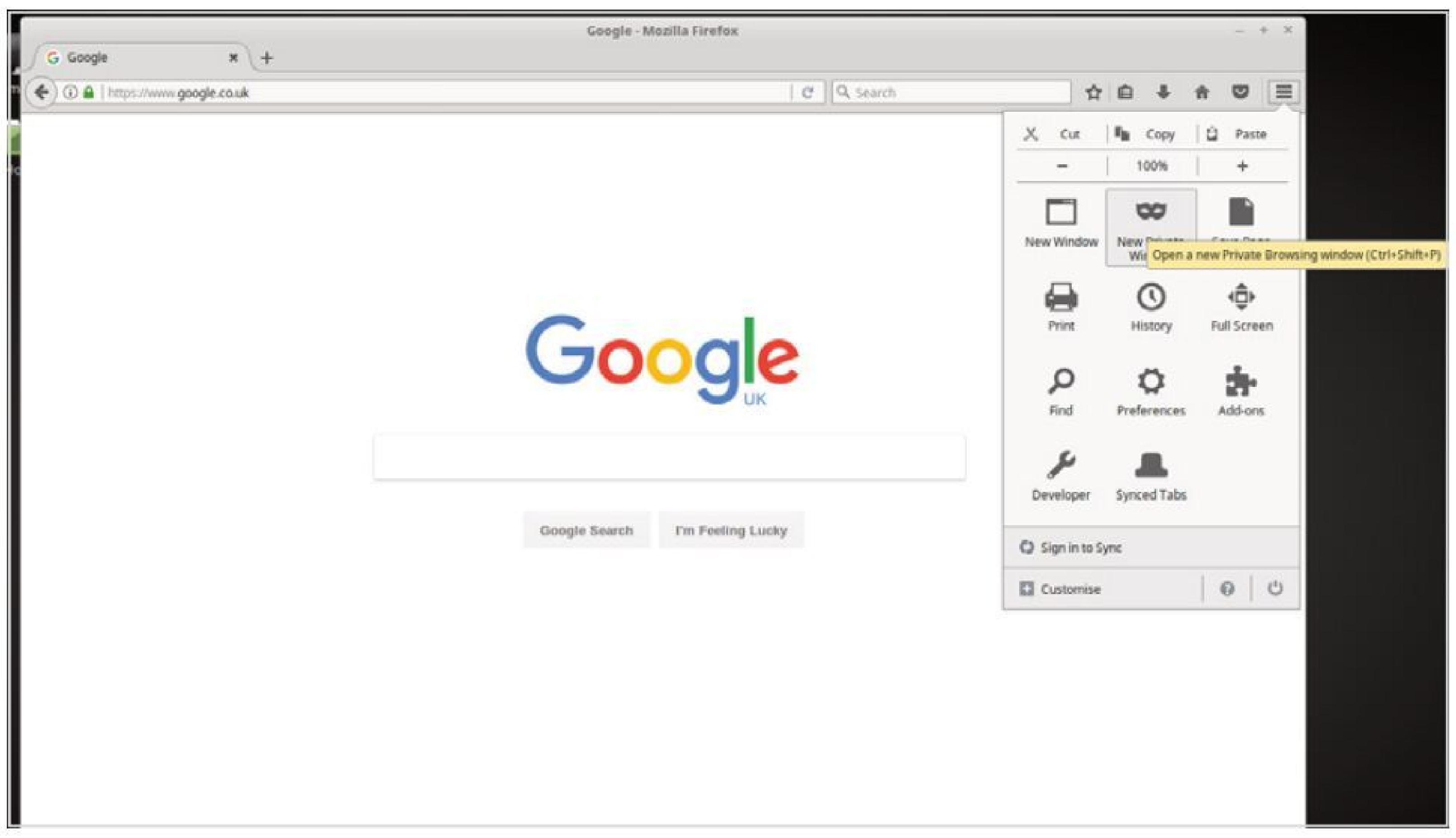
## ANONYMITY WITH MINT

**While it's virtually impossible to become totally anonymous online, you can take measures to ensure our privacy is at its best.**

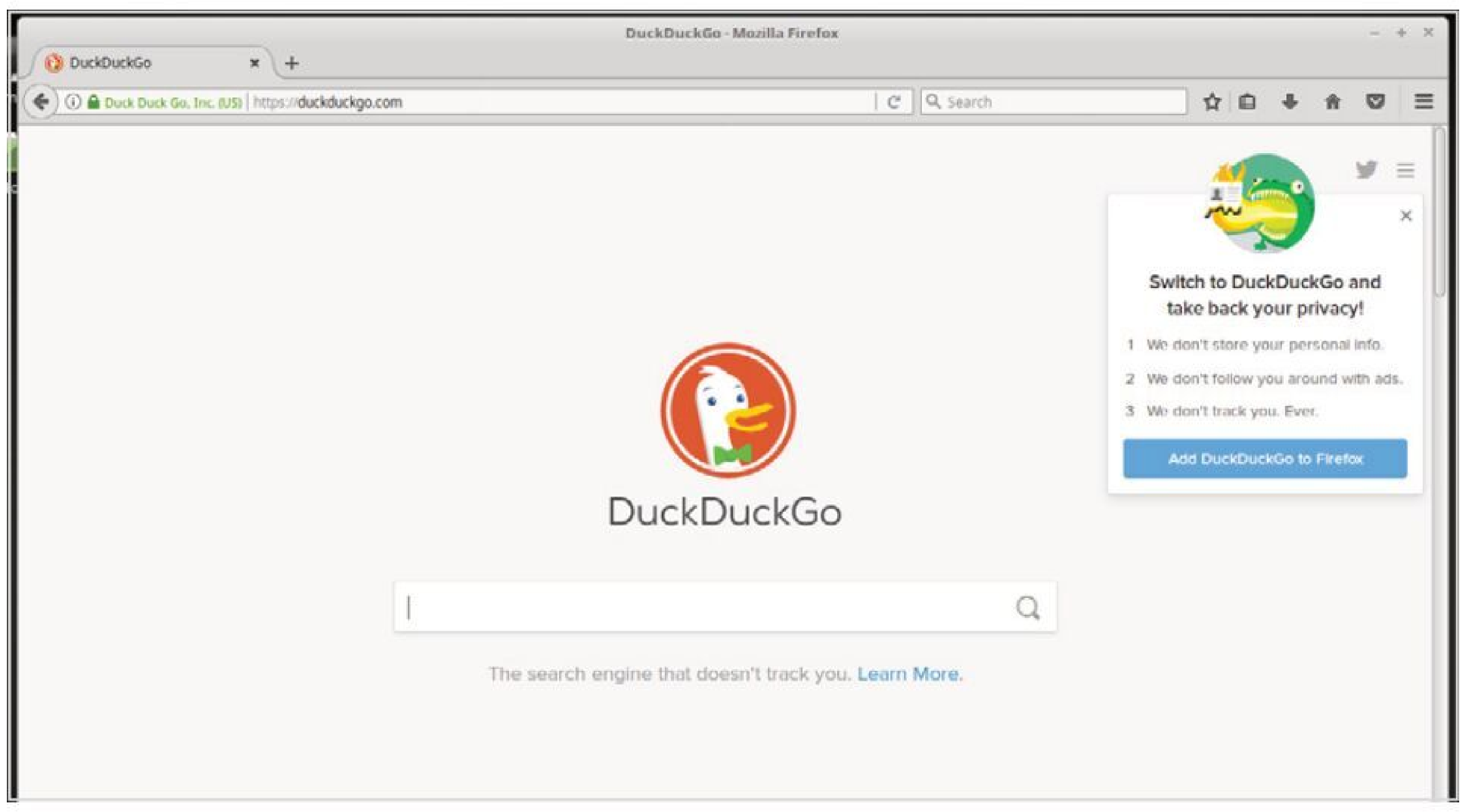
**STEP 1** Starting with the basics, use HTTPS instead of the standard HTTP when browsing. This means that anything that's transmitted over HTTPS is secure (hence the S part at the end) and encrypted.


Google - Mozilla Firefox
Google
https://www.google.co.uk
Search
Gmail
Images
Sign in
Google
UK
Google Search
I'm Feeling Lucky

**STEP 2** When you're browsing, consider using the Incognito or Private browsing modes available in a browser. This disables your web history and web cache, allowing you to browse without the details being stored for later scrutiny by someone else. However, it doesn't stop any data or search tracking.


Google - Mozilla Firefox
Google
https://www.google.co.uk
Search
Cut
Copy
Paste
100%
New Window
Open a new Private Browsing window (Ctrl+Shift+P)
Print
History
Full Screen
Find
Preferences
Add-ons
Developer
Synced Tabs
Sign in to Sync
Customise
Google
UK
Google Search
I'm Feeling Lucky

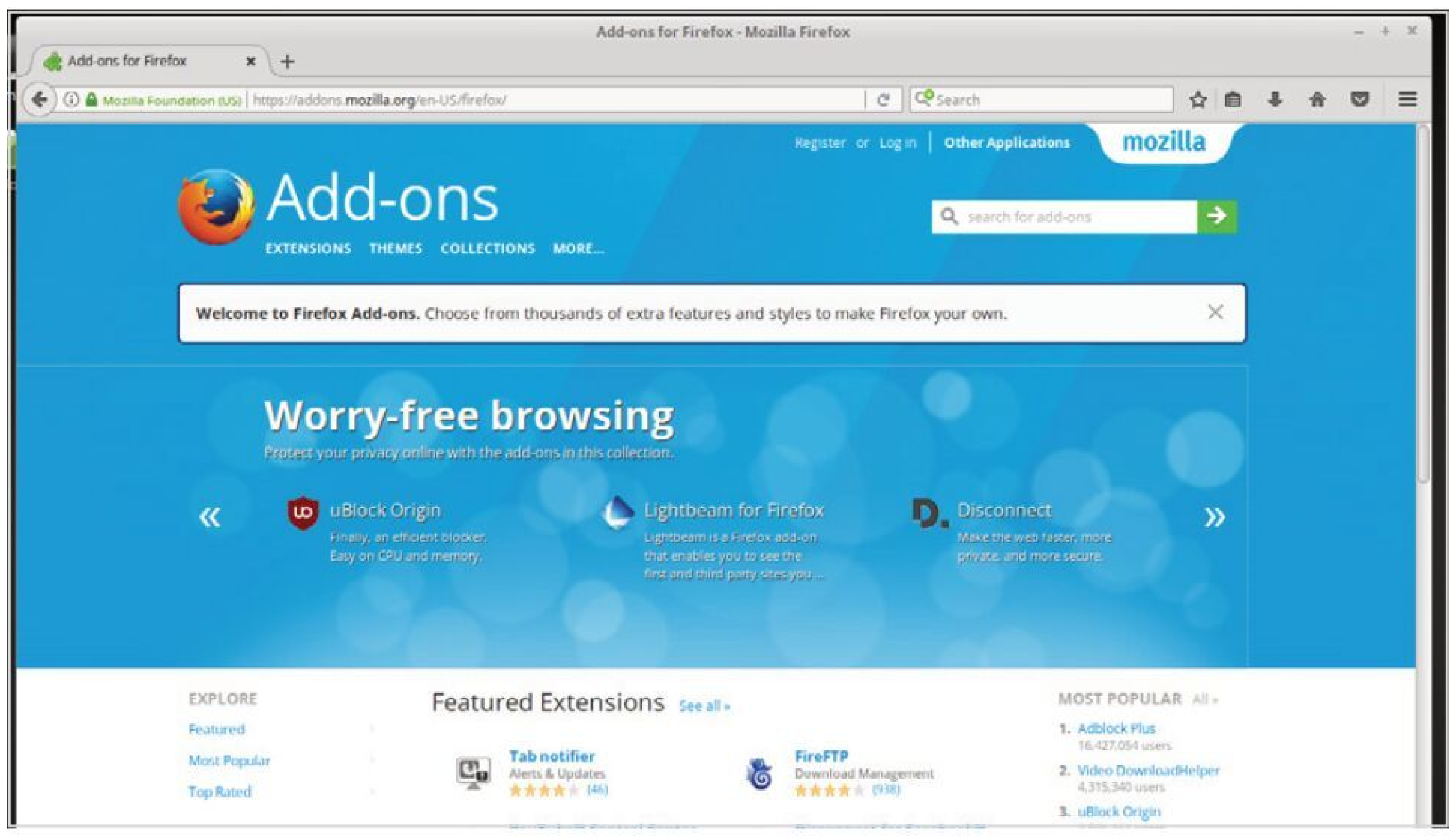
**STEP 3** Although using Google may seem like the obvious choice for a modern Internet search, the company does track all searches made by an individual. Instead, consider an alternative search engine, such as DuckDuckGo, a search engine that doesn't store personal data or track you.


Switch to DuckDuckGo and take back your privacy!

1 We don't store your personal info.
2 We don't follow you around with ads.
3 We don't track you. Ever.

The search engine that doesn't track you. Learn More.
DuckDuckGo - Mozilla Firefox
DuckDuckGo
Duck Duck Go, Inc. (US) https://duckduckgo.com
Search
Add DuckDuckGo to Firefox
DuckDuckGo

**STEP 4** If you're regularly on the Internet then consider installing some of the browser plug-ins that enhance your privacy. For example, for Firefox, use Ghostery, NoScript and Adblock Plus to block trackers, adverts and other data mining techniques.


**Welcome to Firefox Add-ons.** Choose from thousands of extra features and styles to make Firefox your own.

Worry-free browsing

Protect your privacy online with the add-ons in this collection.

uBlock Origin: Finally, an efficient blocker. Easy on CPU and memory.

Lightbeam for Firefox: Lightbeam is a Firefox add-on that enables you to see the first and third party sites you ...

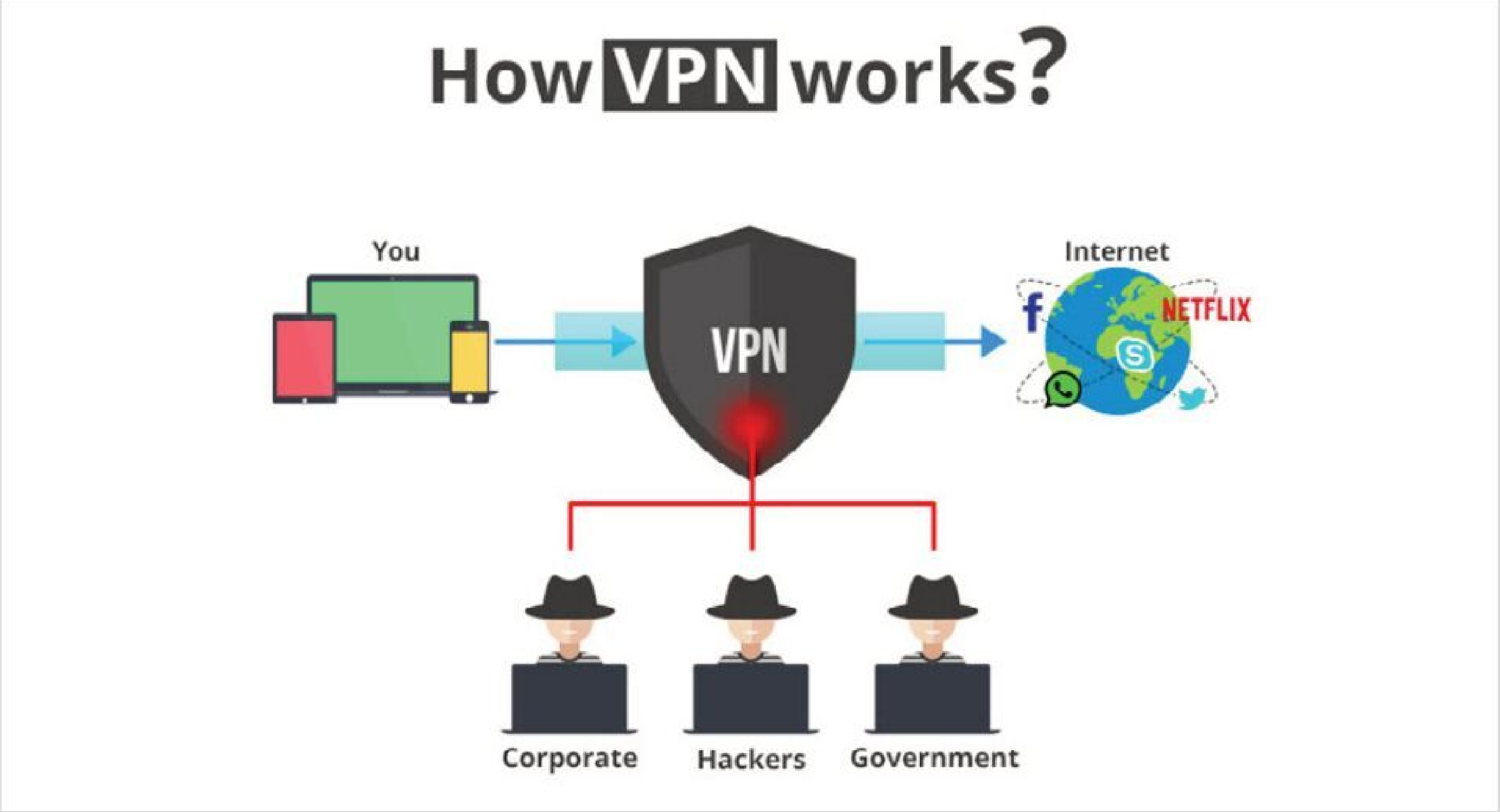
Disconnect: Make the web faster, more private, and more secure.
Add-ons for Firefox - Mozilla Firefox
Add-ons for Firefox
Mozilla Foundation (US) https://addons.mozilla.org/en-US/firefox/
Search
Register or Log in
Other Applications
mozilla
Add-ons
EXTENSIONS
THEMES
COLLECTIONS
MORE...
search for add-ons
EXPLORE
Featured
Most Popular
Top Rated
Featured Extensions
See all »
Tab notifier
Alerts & Updates
(46)
FireFTP
Download Management
(938)
MOST POPULAR
All »
1. Adblock Plus
16,427,054 users
2. Video DownloadHelper
4,315,340 users
3. uBlock Origin

## VPNS AND TOR

**The previous steps can aid your online privacy but to really become anonymous you need a Virtual Private Network and Tor.**

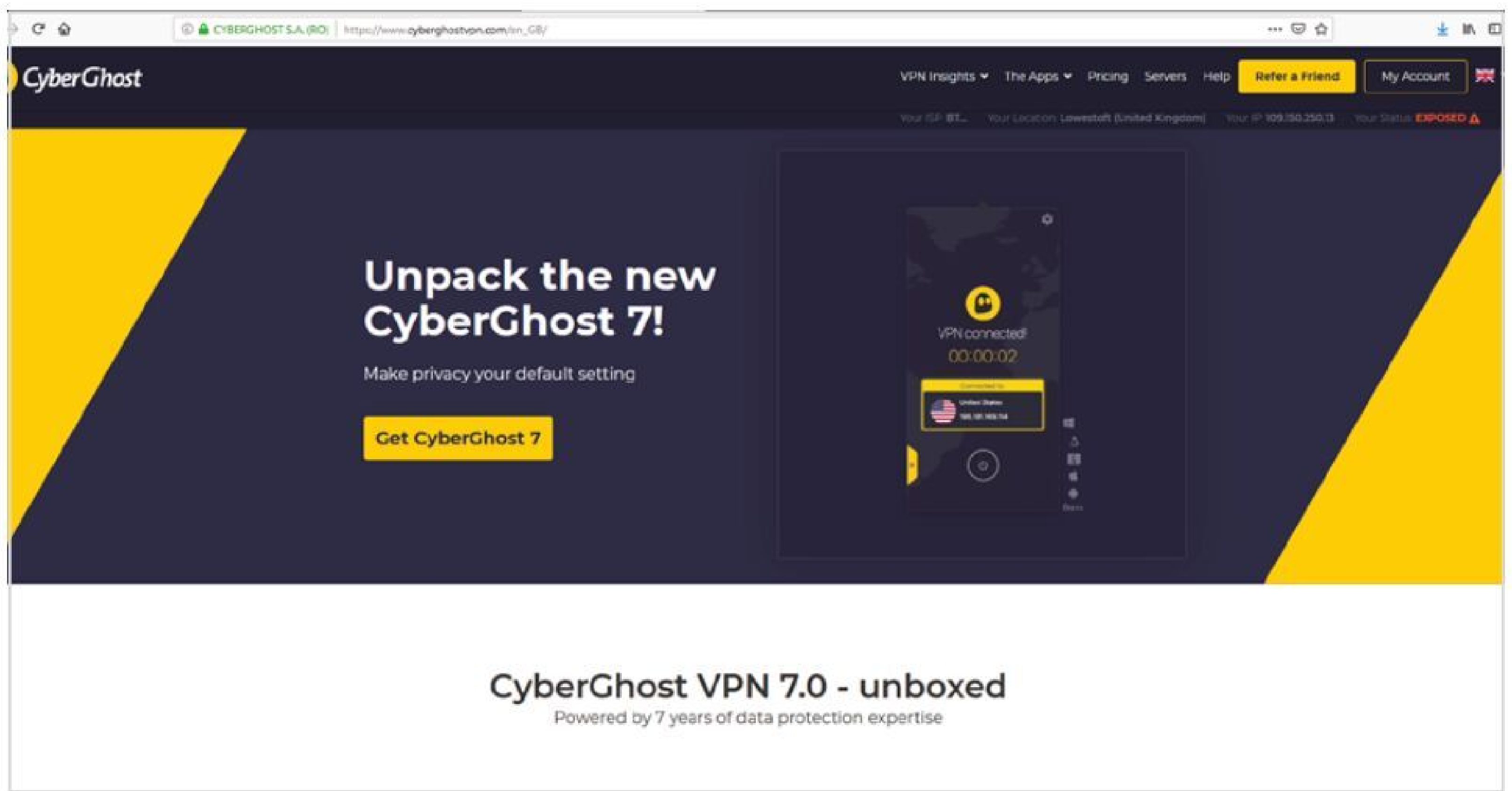
### STEP 1

A VPN is a remote server, or cluster of servers, that establishes a connection with your computer. The end result is that your computer's identity on the Internet is hidden behind the VPN remote server; so you could live in the UK but have an IP address (the computer online identity) belonging to Iceland.


How VPN works?
You
VPN
Internet
NETFLIX
Corporate
Hackers
Government

### STEP 2

Most good VPNs charge a monthly or annual fee but it's worth the expense. We use CyberGhost, **www.cyberghostvpn.com**, which offers VPN connections for Windows, Mac, Mint (as well as other Linux distros), Android and iOS devices. Details for each OS can be found at **www.support.cyberghostvpn.com/hc/en-us/articles/213190329-Read-me-first-**.


CyberGhost
VPN Insights
The Apps
Pricing
Servers
Help
Refer a Friend
My Account
Get CyberGhost 7
VPN connected!
00:00:02

Unpack the new CyberGhost 7!

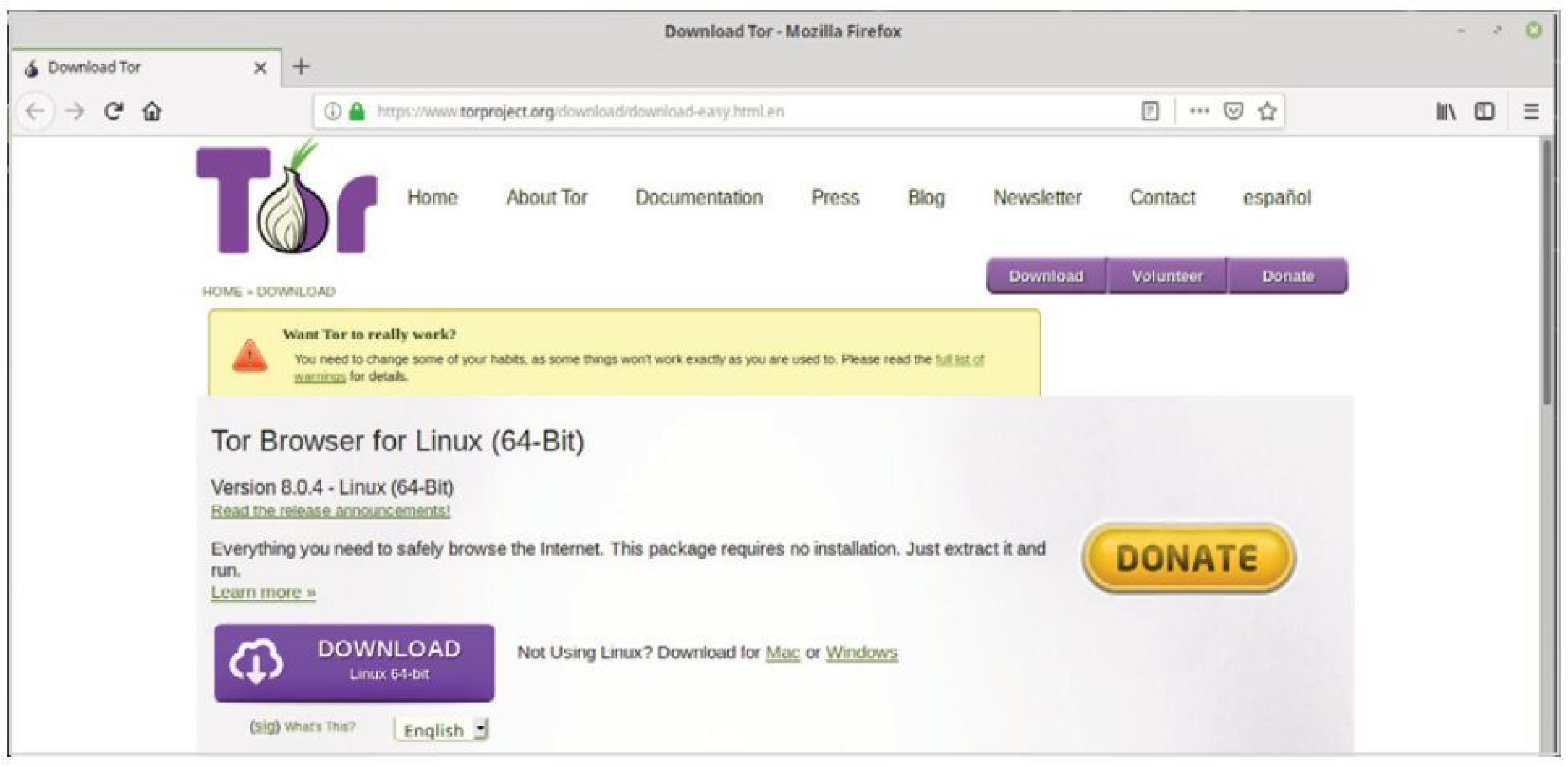
Make privacy your default setting

CyberGhost VPN 7.0 - unboxed

Powered by 7 years of data protection expertise

### STEP 3

Another option is to use Tor. Tor is an open network that you can attach to that hides your IP address behind countless nodes around the world. It's available for Windows, Mac and Linux computers and is very easy to install and use. Start by navigating to **www.torproject.org/download/download-easy.html.en** and clicking on the Download Linux 64-bit button.


Download Tor - Mozilla Firefox
Download Tor
https://www.torproject.org/download/download-easy.html.en
Home
About Tor
Documentation
Press
Blog
Newsletter
Contact
español
Download
Volunteer
Donate
HOME » DOWNLOAD
DONATE
DOWNLOAD
Linux 64-bit
(sig) What's This?
English

Want Tor to really work?

You need to change some of your habits, as some things won't work exactly as you are used to. Please read the full list of warnings for details.

Tor Browser for Linux (64-Bit)

Version 8.0.4 - Linux (64-Bit)

Read the release announcements!

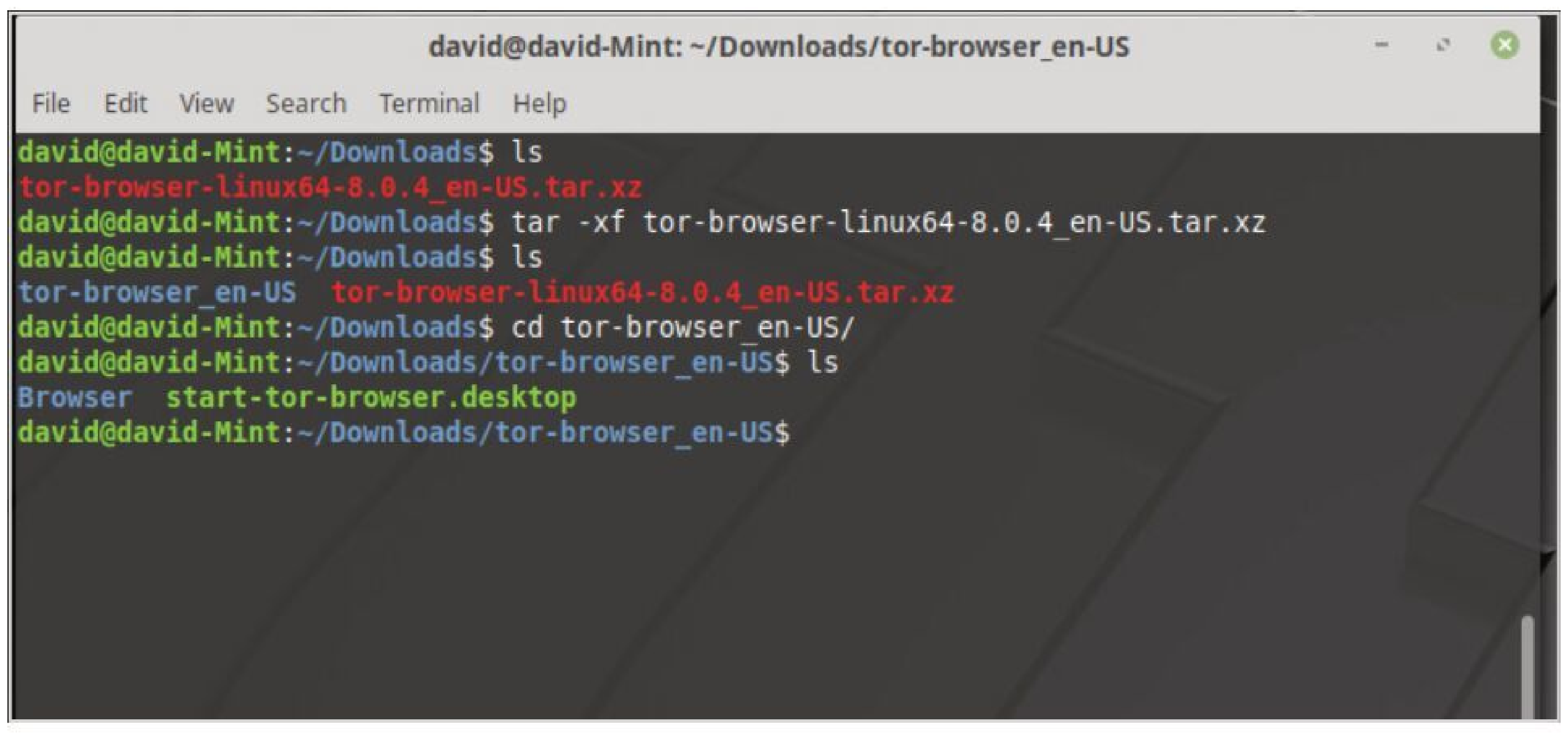
Everything you need to safely browse the Internet. This package requires no installation. Just extract it and run.

Learn more »

Not Using Linux? Download for Mac or Windows

### STEP 4

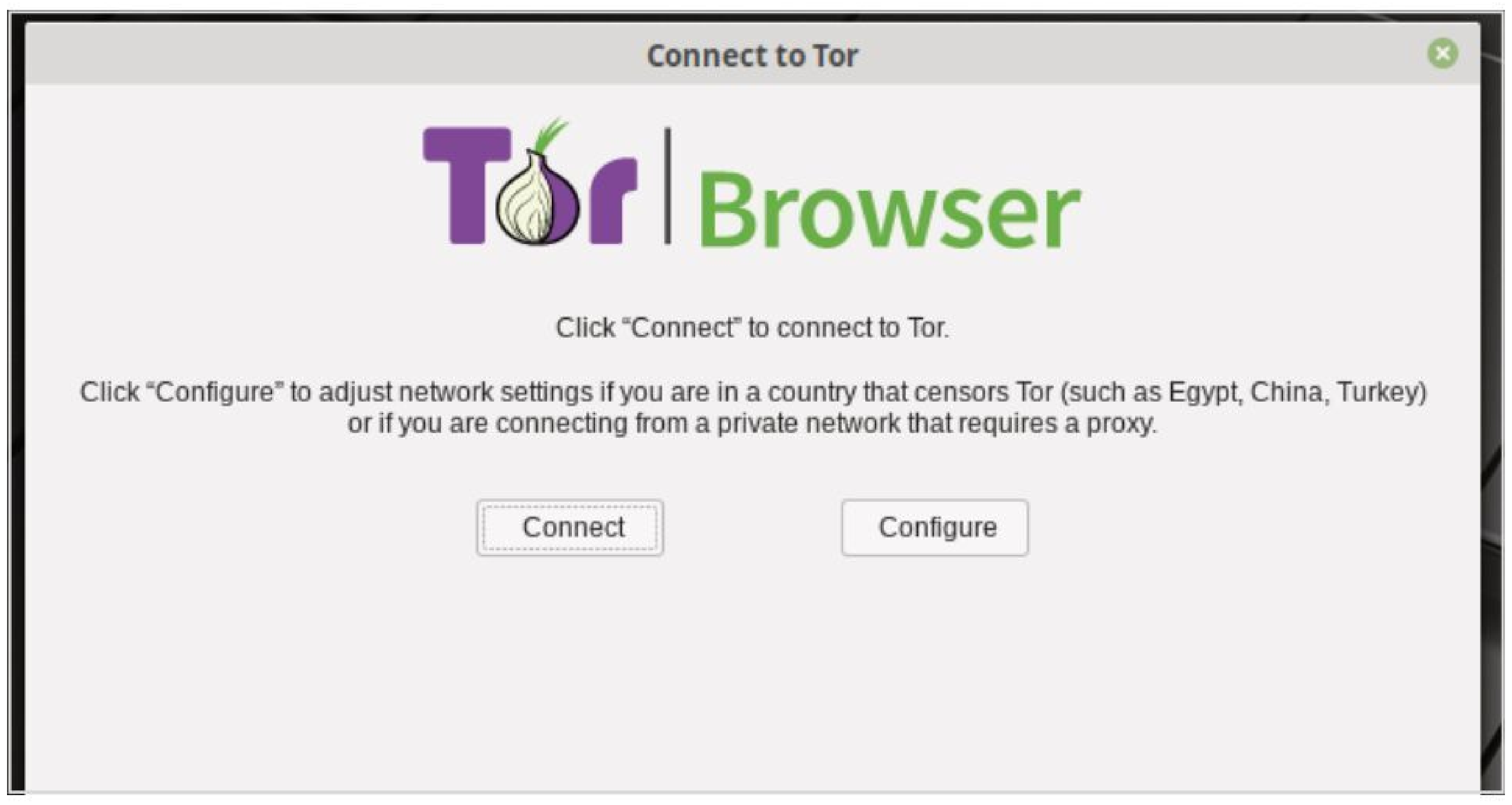
When the download has finished, drop into the Terminal and enter the Downloads folder, `cd Downloads/`. Enter `ls` to check the tar.xz Tor file is present, then enter: `tar -xf tor-browser-linux64-8.0.4_en-US.tar.xz` (Tor is updated regularly, so if your version is different press Tab to autocomplete the `tor-browser-` filename). When the files are unpacked, use `cd tor-browser_en-US/` to enter the new folder.


david@david-Mint: ~/Downloads/tor-browser_en-US
File
Edit
View
Search
Terminal
Help

```
david@david-Mint:~/Downloads$ ls
tor-browser-linux64-8.0.4_en-US.tar.xz
david@david-Mint:~/Downloads$ tar -xf tor-browser-linux64-8.0.4_en-US.tar.xz
david@david-Mint:~/Downloads$ ls
tor-browser_en-US  tor-browser-linux64-8.0.4_en-US.tar.xz
david@david-Mint:~/Downloads$ cd tor-browser_en-US/
david@david-Mint:~/Downloads/tor-browser_en-US$ ls
Browser  start-tor-browser.desktop
david@david-Mint:~/Downloads/tor-browser_en-US$
```

### STEP 5

A quick `ls` reveals a couple of entries: a folder called Browser and a file called 'start-tor-browser.desktop'. To start the Tor setup, type `./start-tor-browser.desktop`. This command launches the Tor setup, where you are offered two options: Connect or Configure. For most users, the Connect option will suffice. Click Connect when you're ready.

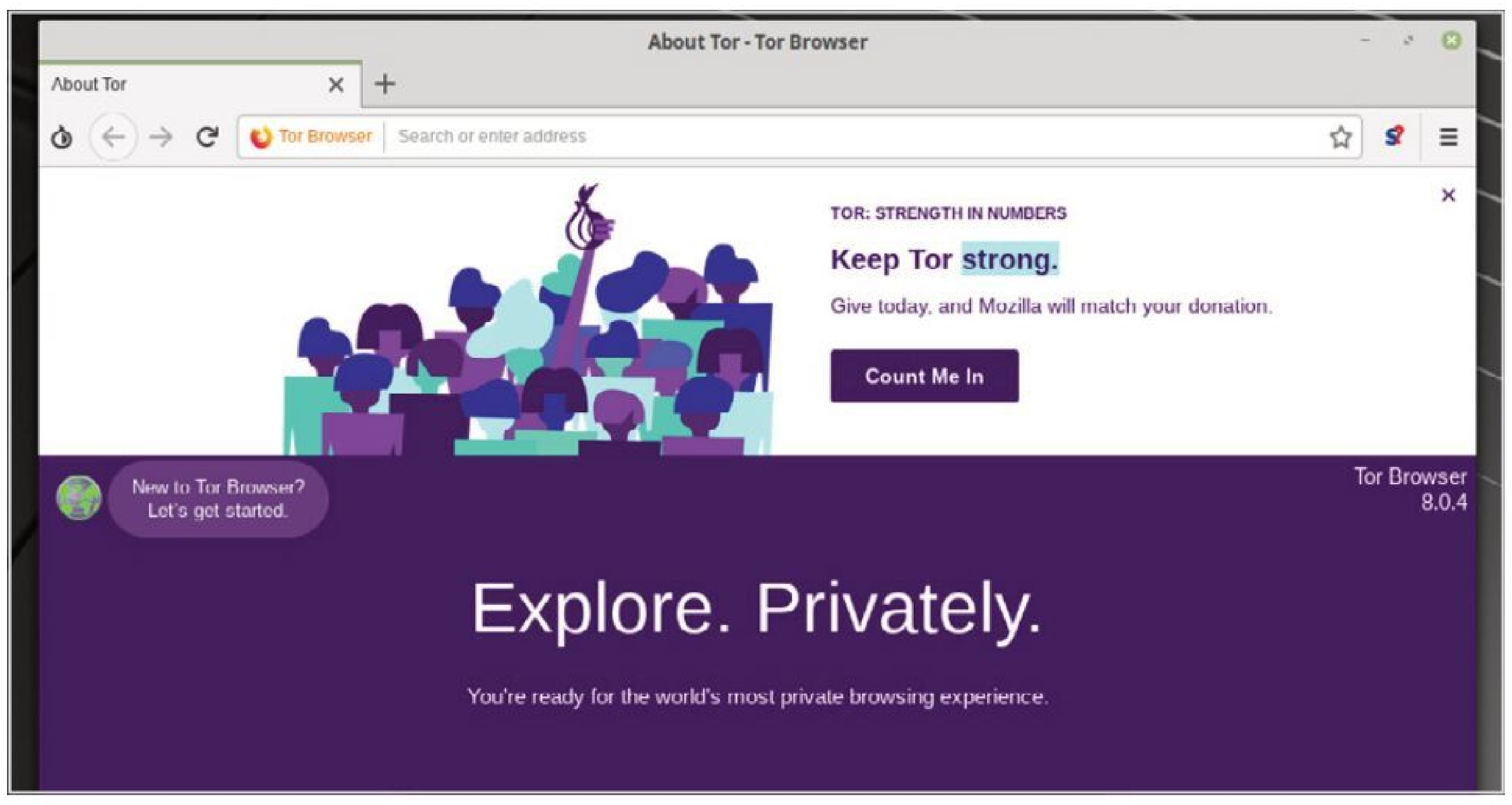

Connect to Tor
Tor Browser
Connect
Configure

Click "Connect" to connect to Tor.

Click "Configure" to adjust network settings if you are in a country that censors Tor (such as Egypt, China, Turkey) or if you are connecting from a private network that requires a proxy.

### STEP 6

After the connection is established, the Tor Browser launches. This is a customised version of Firefox and from here you can securely browse the Internet without fear of being viewed or tracked. Mixing both a VPN and Tor makes for an extremely secure and private connection to the online world.


About Tor - Tor Browser
About Tor
Tor Browser
Search or enter address
Count Me In
Tor Browser
8.0.4

TOR: STRENGTH IN NUMBERS

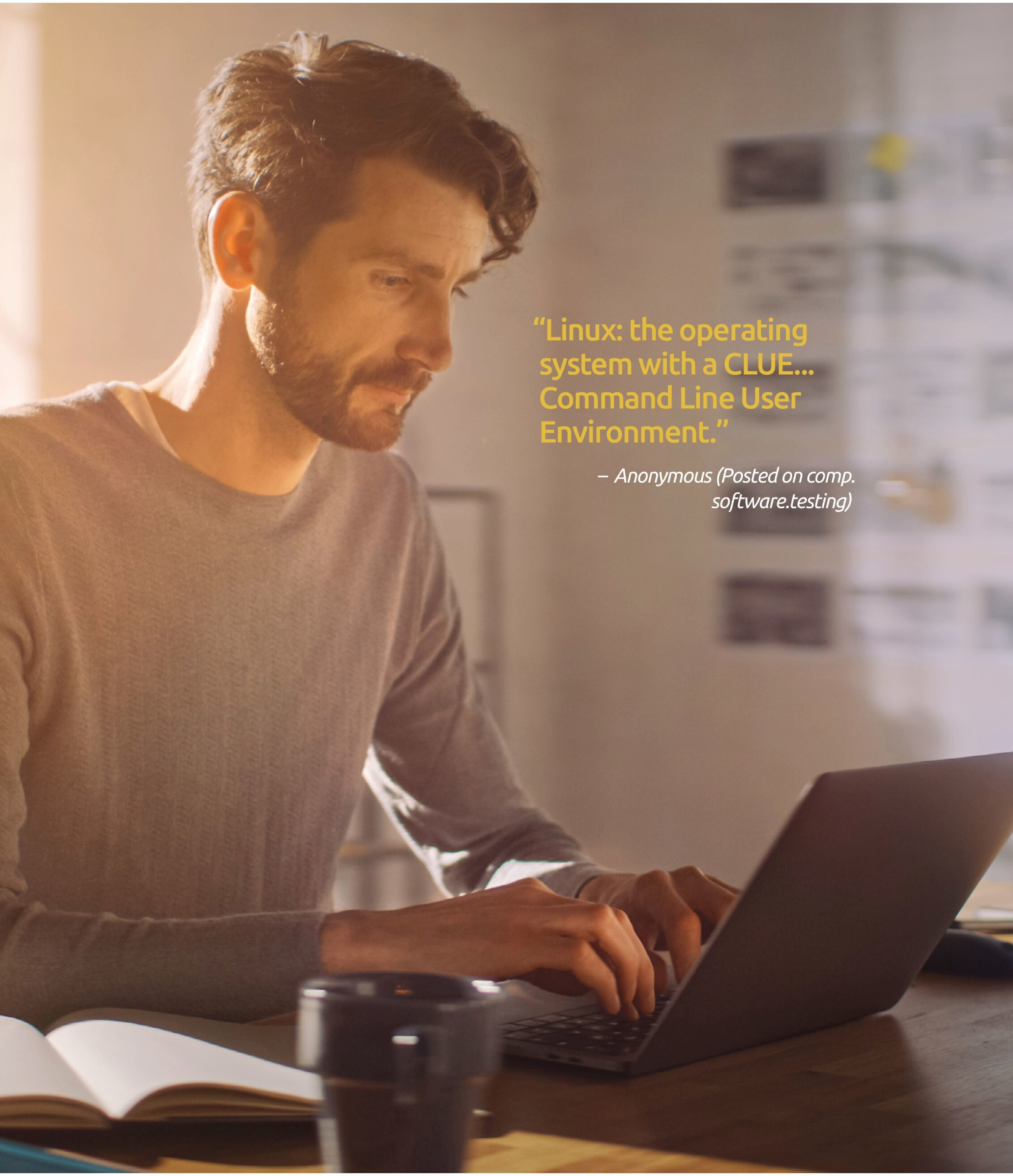
Keep Tor strong.

Give today, and Mozilla will match your donation.

New to Tor Browser? Let's get started.

Explore. Privately.

You're ready for the world's most private browsing experience.



> “Linux: the operating system with a CLUE... Command Line User Environment.”
>
> – *Anonymous (Posted on comp. software.testing)*

# Using the Terminal

The Linux command line, the Terminal, is an incredibly powerful environment. From it, you can bring the OS to its knees, or update it to something spectacular. You can hack into remote computers, look at an animated ASCII camp fire, install new apps and programs, watch Star Wars played out from a server in the Netherlands, and code intricate automated scripts.

In this section you will explore the intricacies of the Terminal, and how it works with Linux. You will learn how to manipulate the Linux file system from the Terminal, and you will discover some odd, but fun things you can do in the Terminal.

The Terminal rules supreme in the world of Linux. Learn how it works, and you can access all that power.

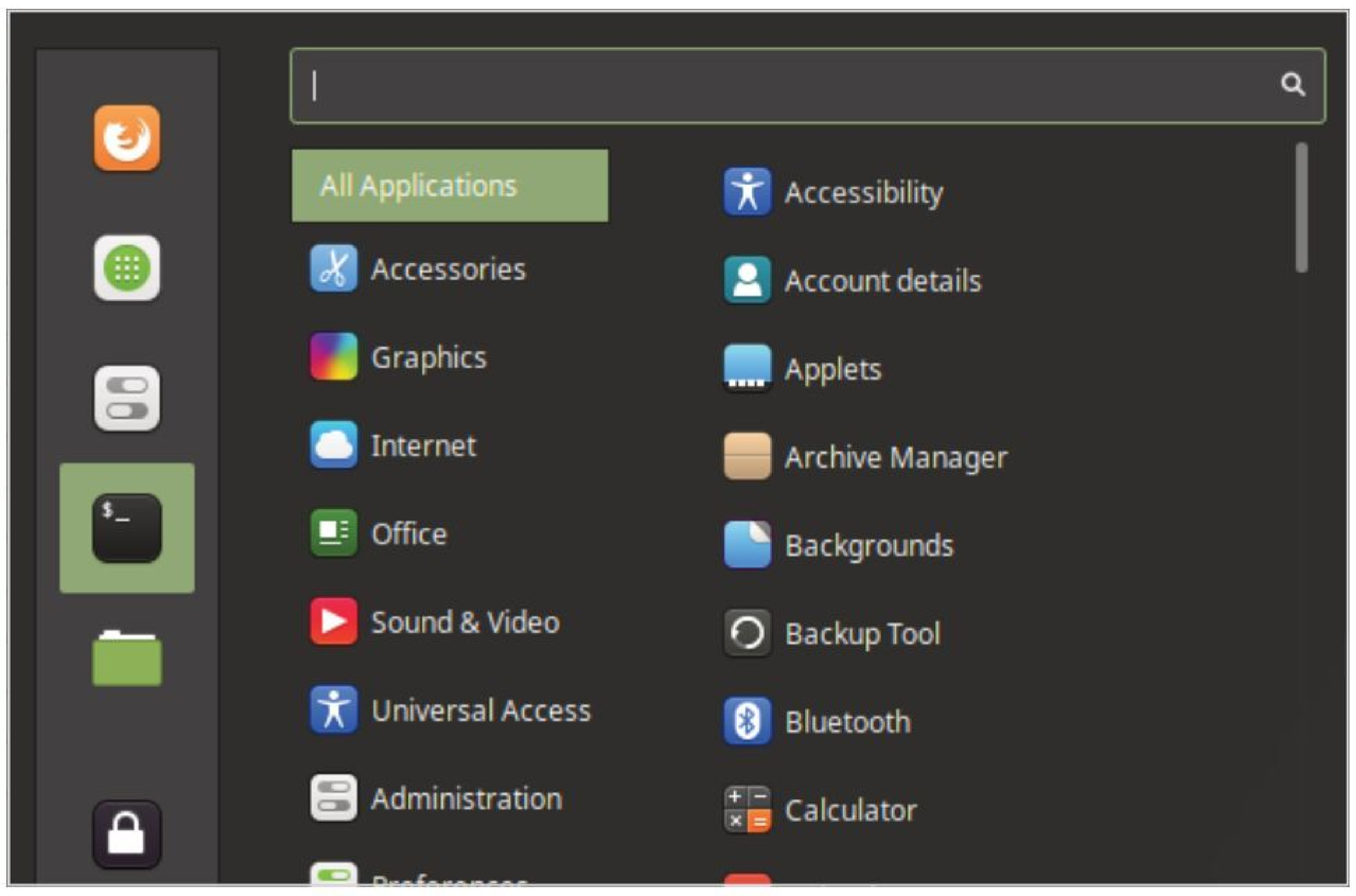
# Basics of the Terminal

Most operating systems use two kinds of interface, the GUI, which is the desktop that Windows, macOS and Linux Mint boot into and the command line. While modern operating systems shy away from the command line, Mint uses the Terminal to give the user greater control of the system.

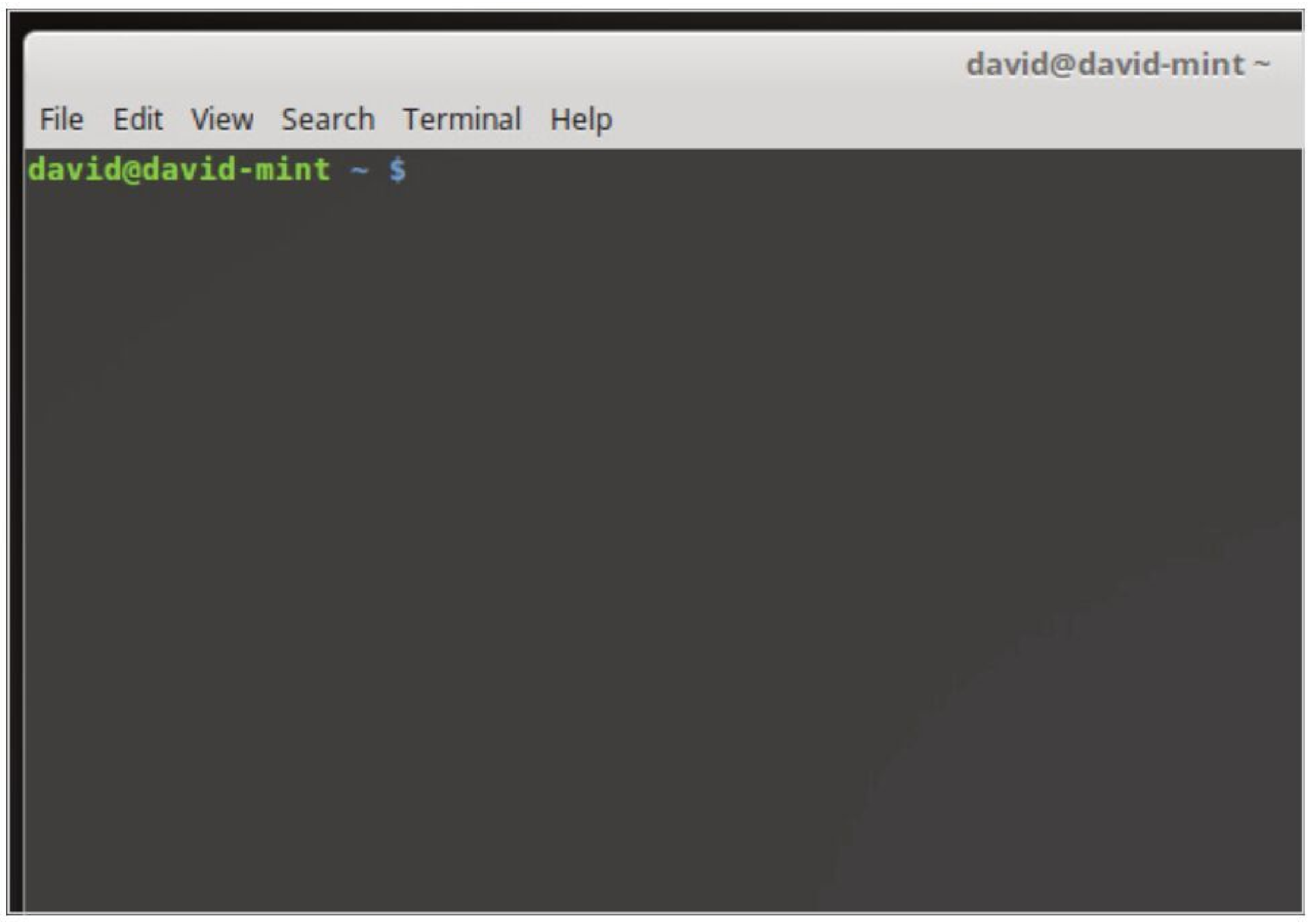
## TAKING COMMAND

**The command line, or Terminal, is an extremely powerful interface. Everything you can do on the desktop can be done within the Terminal. Let's start by seeing how it works.**

**STEP 1** The Terminal can be accessed by either clicking on the Terminal icon on the Panel, located between the Firefox and files icons or launched by opening the Menu and selecting it from the left-hand quick launch strip.

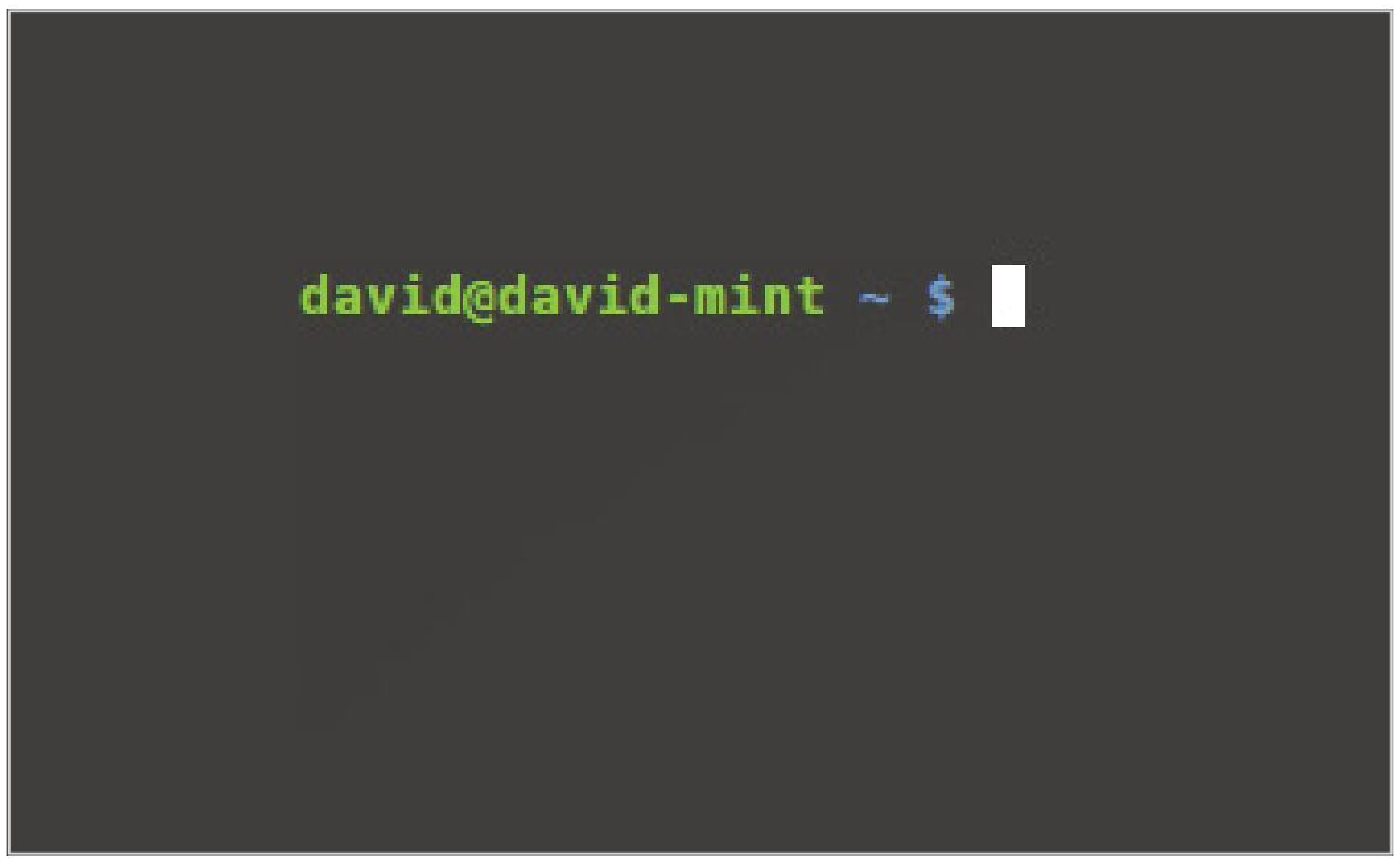

All Applications
Accessories
Graphics
Internet
Office
Sound & Video
Universal Access
Administration
Accessibility
Account details
Applets
Archive Manager
Backgrounds
Backup Tool
Bluetooth
Calculator

**STEP 2** The Terminal gives you access to the Linux Mint Shell, called Bash, which gives you access to the underlying operating system. Everything in Mint, including the desktop and GUI, is a module running from the command line.


david@david-mint ~
File Edit View Search Terminal Help

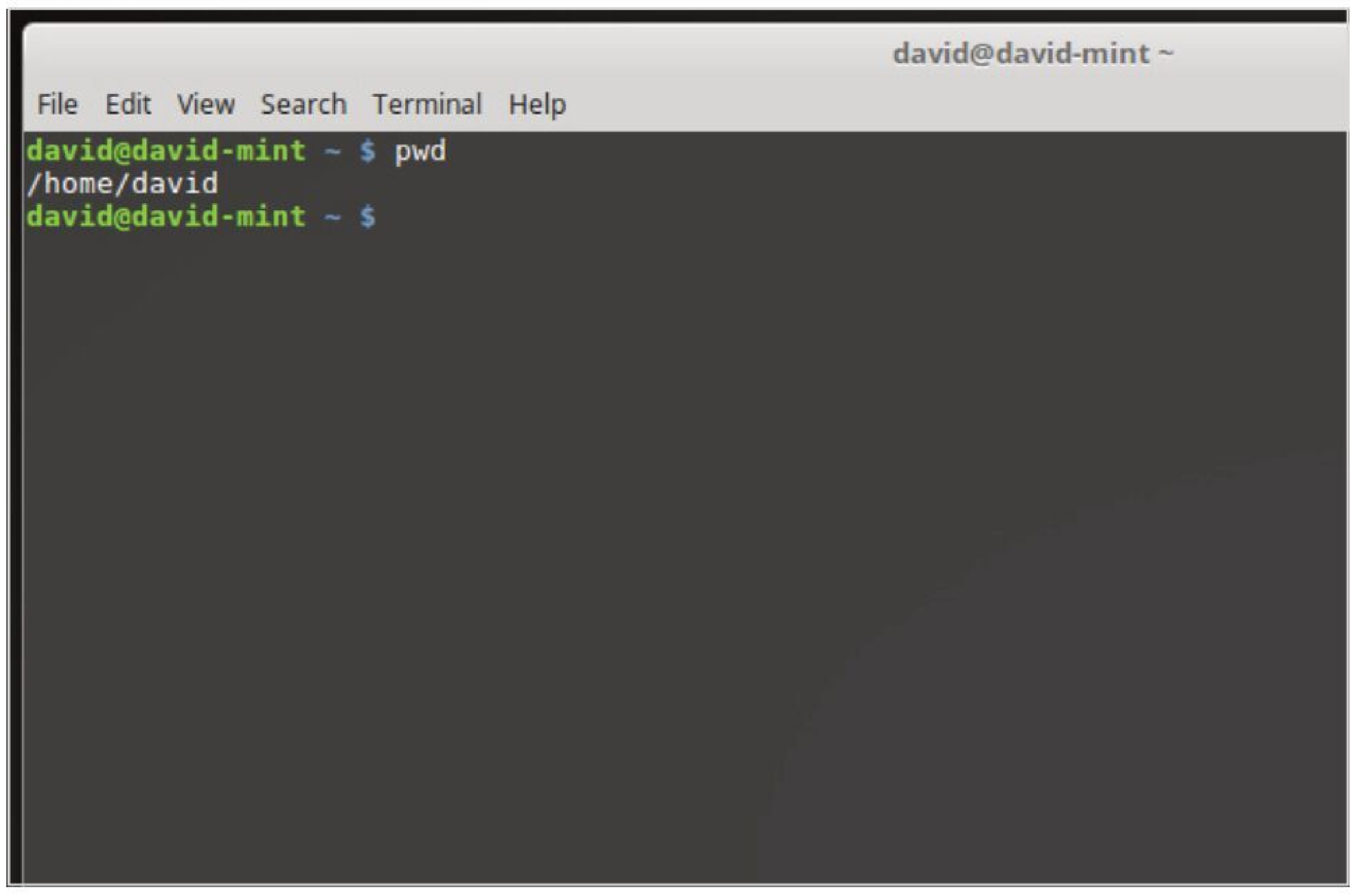
```
david@david-mint ~ $
```

**STEP 3** What you currently see in the Terminal is your login name followed by the name of the computer; as you named it during setup when you first installed Mint. The line then ends with the current folder name; at first this is just a tilde ~, which means your Home folder.



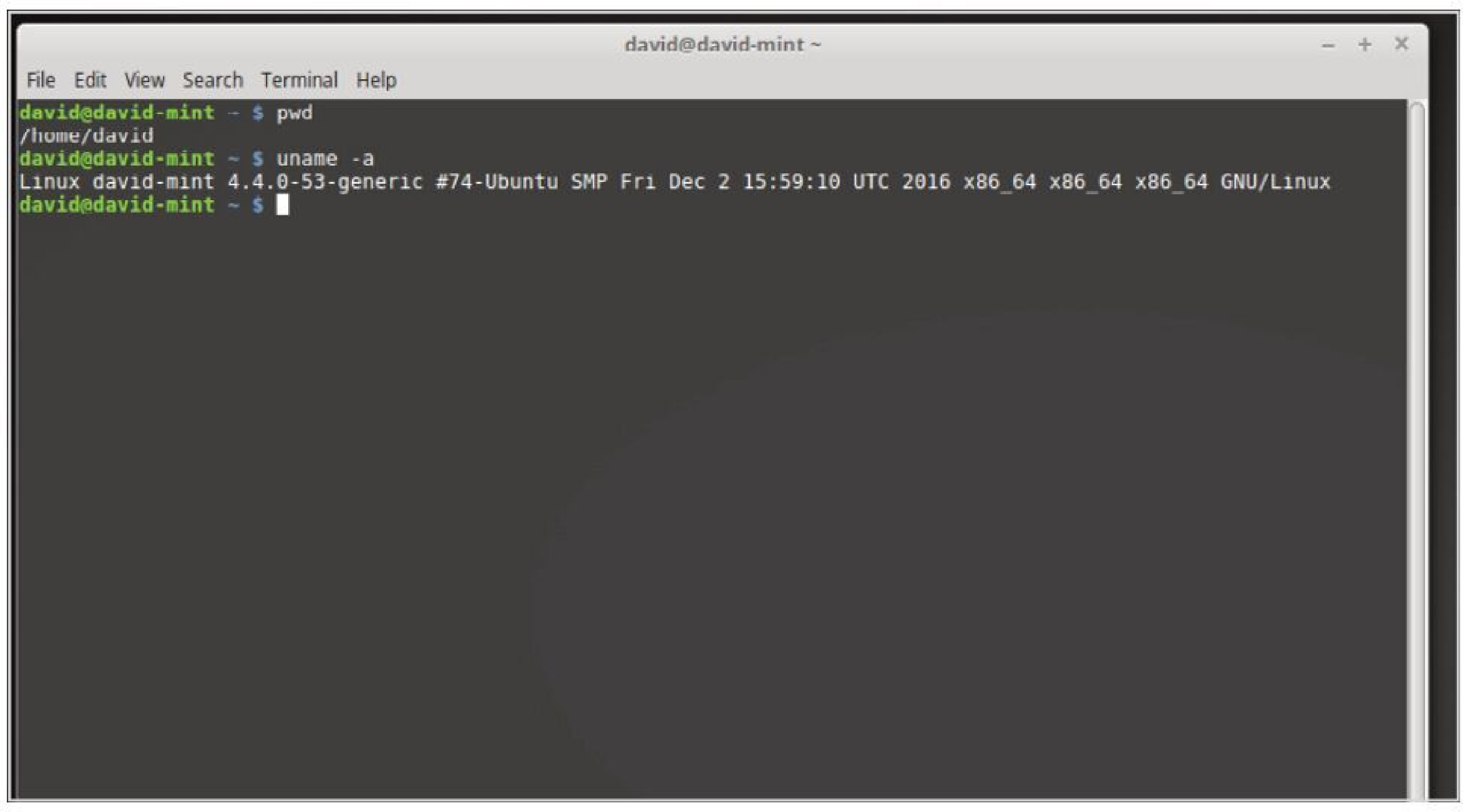
```
david@david-mint ~ $
```

**STEP 4** The flashing cursor at the very end of the line is where your text-based commands are entered. You can begin to experiment with a simple command, Print Working Directory (pwd), which outputs the current folder you're in to the screen. Type pwd and press Enter.


david@david-mint ~
File Edit View Search Terminal Help

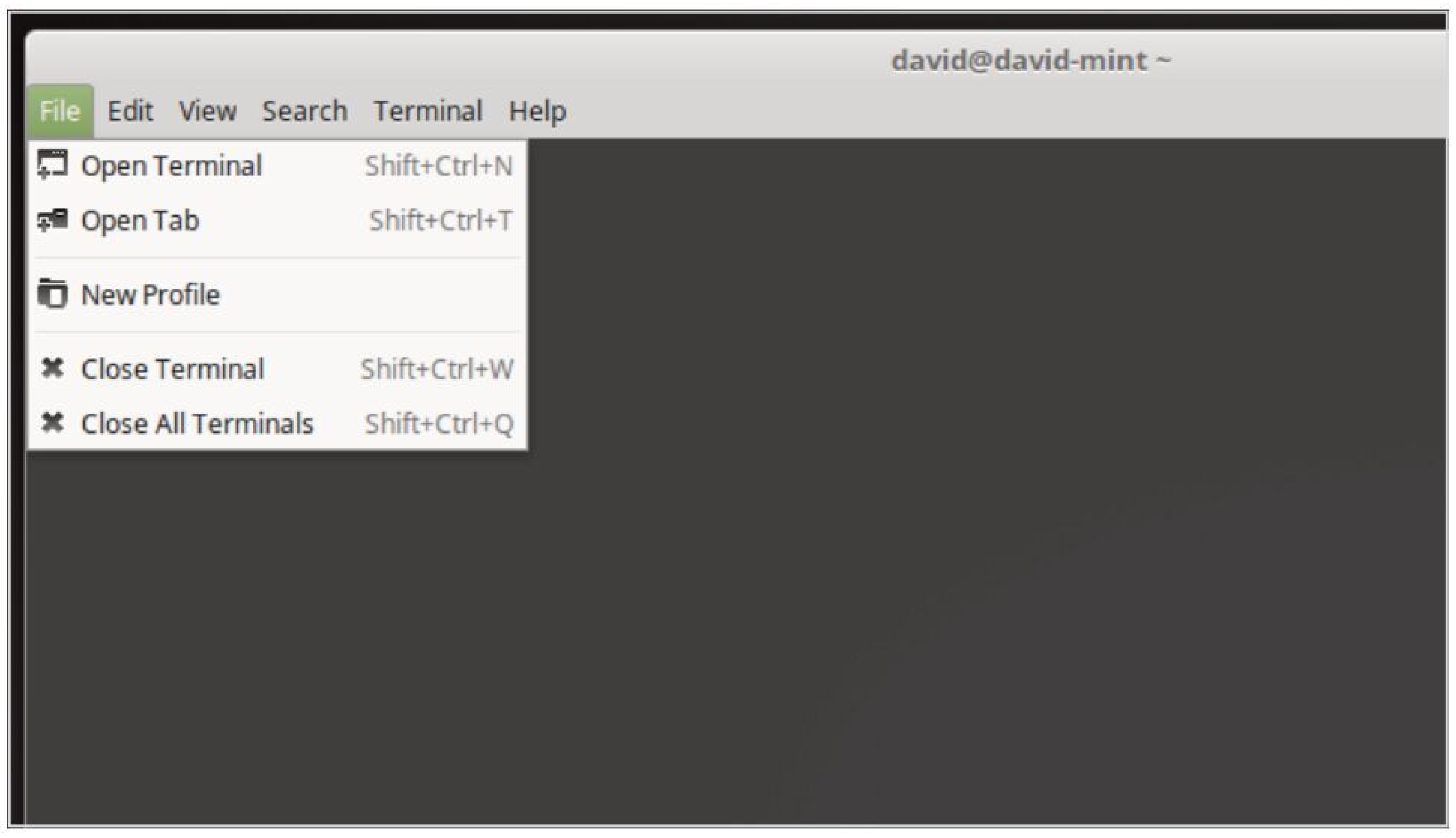
```
david@david-mint ~ $ pwd
/home/david
david@david-mint ~ $
```

**STEP 5** All the commands you enter work in the same manner: you enter the command, include any parameters to extend the use of the command and press Enter to execute the command line you've entered. Type into the Terminal: `uname –a` and press Enter. This displays some system information regarding Mint.

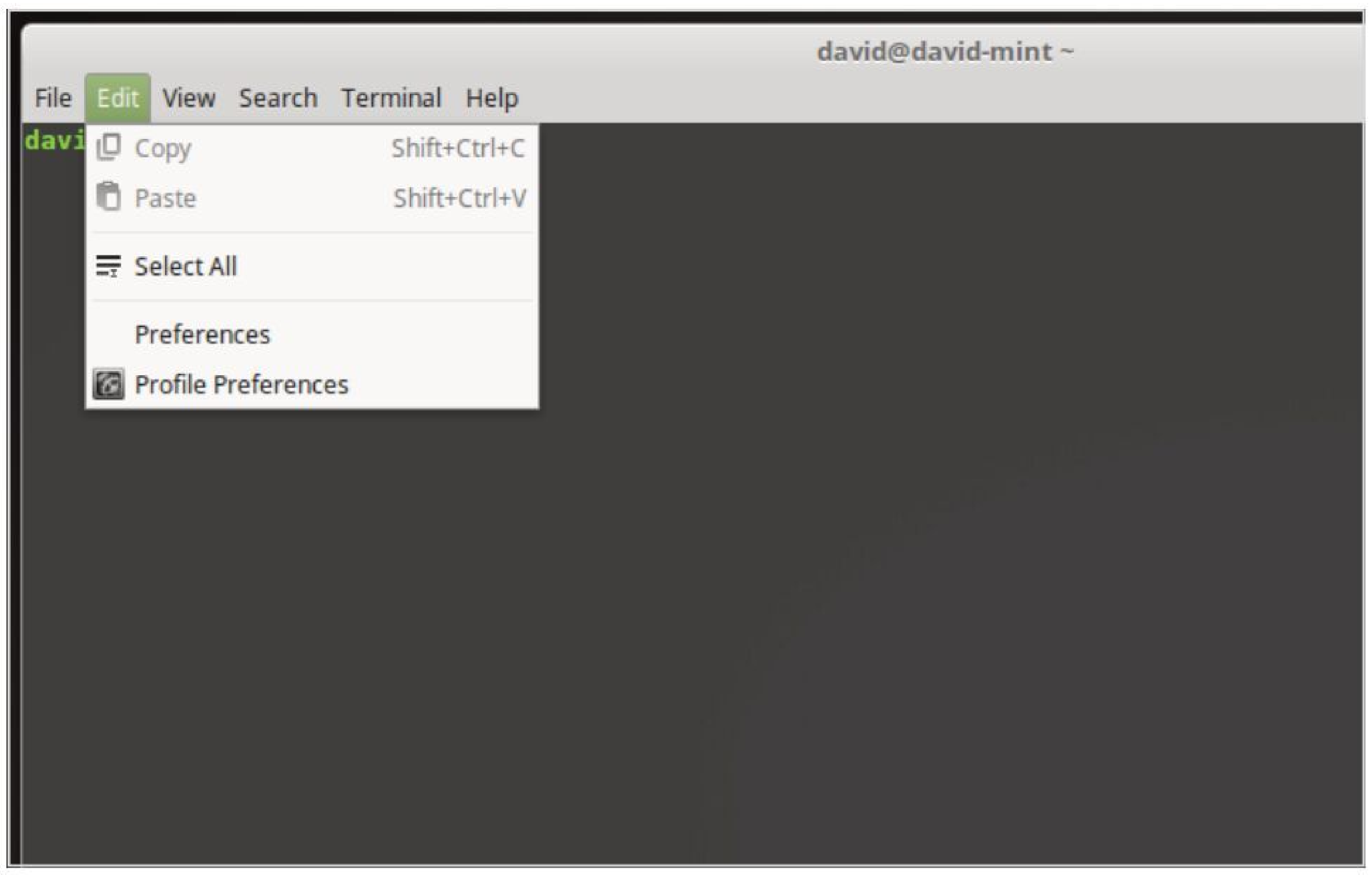

david@david-mint ~
File Edit View Search Terminal Help

```
david@david-mint ~ $ pwd
/home/david
david@david-mint ~ $ uname -a
Linux david-mint 4.4.0-53-generic #74-Ubuntu SMP Fri Dec 2 15:59:10 UTC 2016 x86_64 x86_64 x86_64 GNU/Linux
david@david-mint ~ $ 
```

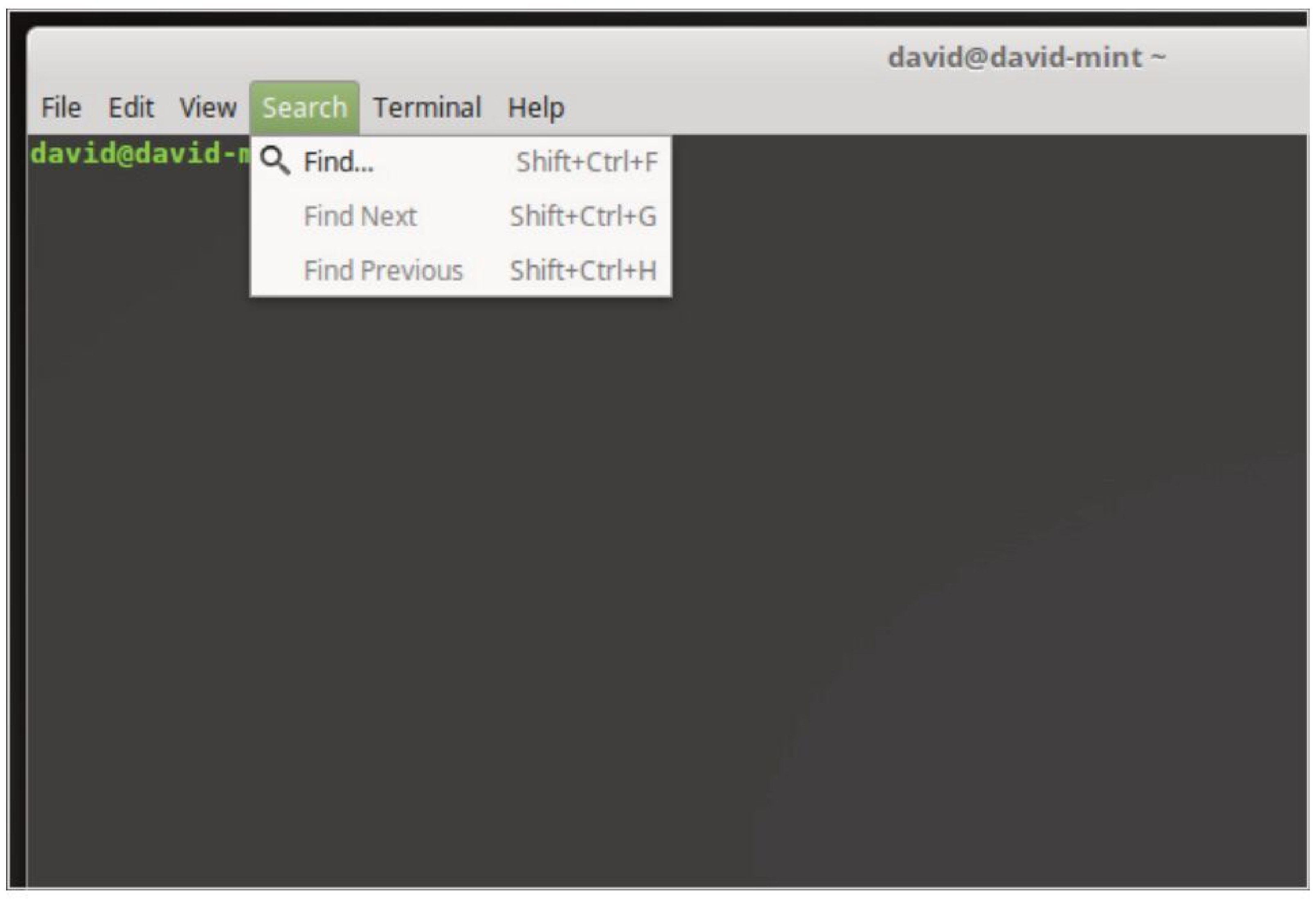
**STEP 6** Before we get into entering commands, let's take a moment to see what menus the Terminal has to offer. The File menu option allows you to open a new Terminal, create a new profile, where you can alter the size, colours and behaviour of the Terminal, add a new tab, and close all current active Terminal sessions.


david@david-mint ~
File Edit View Search Terminal Help
Open Terminal Shift+Ctrl+N
Open Tab Shift+Ctrl+T
New Profile
Close Terminal Shift+Ctrl+W
Close All Terminals Shift+Ctrl+Q

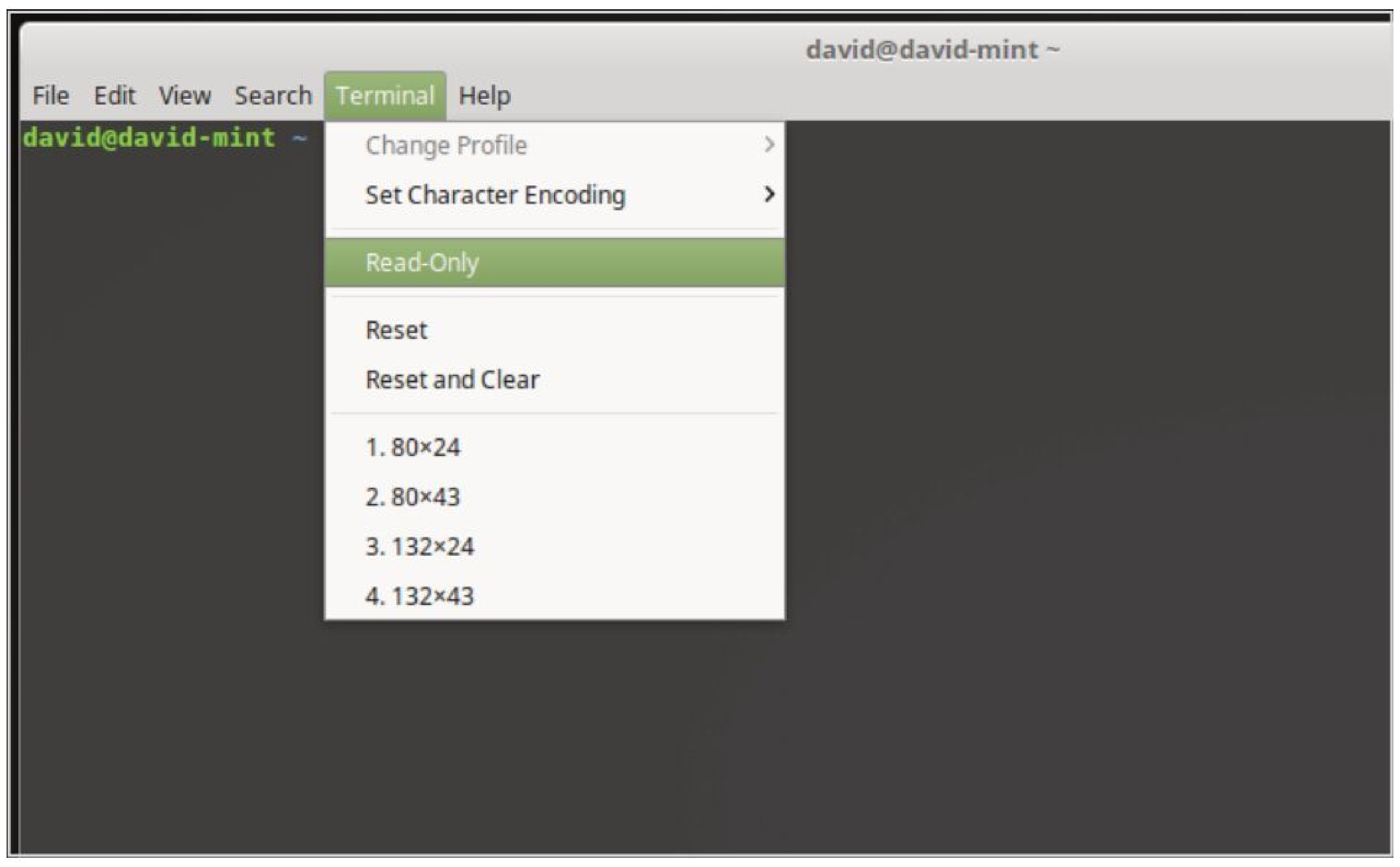
**STEP 7** The Edit option lets you copy and paste commands to and from the Terminal and other sources; handy for when you want to copy a very long and complex command from a web page. It also allows you to edit the current profile preferences.


david@david-mint ~
File Edit View Search Terminal Help
davi
Copy Shift+Ctrl+C
Paste Shift+Ctrl+V
Select All
Preferences
Profile Preferences

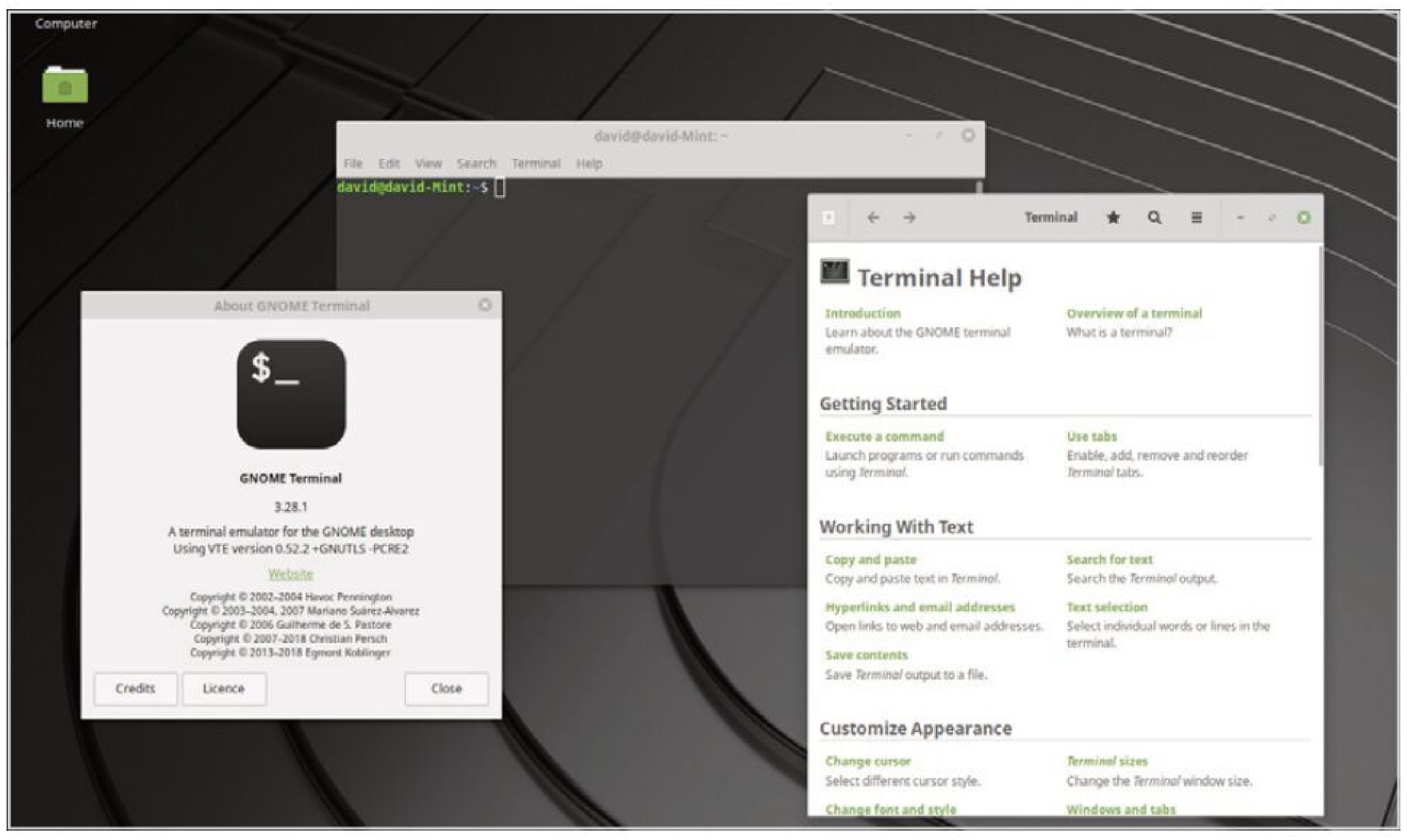
**STEP 8** View and Search options let you alter the sizing of the Terminal window and of course search within the Terminal for any particular key words.


david@david-mint ~
File Edit View Search Terminal Help
david@david-m
Find... Shift+Ctrl+F
Find Next Shift+Ctrl+G
Find Previous Shift+Ctrl+H

**STEP 9** The Terminal entry extends the profile editing and sizing and allows you to alter the character encoding. Interestingly, you can also set it to a Read Only mode, which stops you from entering any commands into the Terminal; this is good for when you need to permanently display the Terminal contents.


david@david-mint ~
File Edit View Search Terminal Help
david@david-mint ~
Change Profile
Set Character Encoding
Read-Only
Reset
Reset and Clear
1. 80×24
2. 80×43
3. 132×24
4. 132×43

**STEP 10** Finally, the Help option displays the help contents and version number of the Terminal, or to be more precise, GNOME Terminal; we'll simply refer to it as Terminal in future. The Contents are worth having a quick read through, to help familiarise yourself with how the Terminal works.


Computer
Home
david@david-Mint: ~
File Edit View Search Terminal Help
david@david-Mint:~$
About GNOME Terminal
Credits
Licence
Close
Terminal

GNOME Terminal

3.28.1

A terminal emulator for the GNOME desktop
Using VTE version 0.52.2 +GNUTLS -PCRE2

Website

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Copyright © 2006 Guilherme de S. Pastore
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Terminal Help

Introduction
Learn about the GNOME terminal emulator.

Overview of a terminal
What is a terminal?

Getting Started

Execute a command
Launch programs or run commands using *Terminal*.

Use tabs
Enable, add, remove and reorder *Terminal* tabs.

Working With Text

Copy and paste
Copy and paste text in *Terminal*.

Search for text
Search the *Terminal* output.

Hyperlinks and email addresses
Open links to web and email addresses.

Text selection
Select individual words or lines in the terminal.

Save contents
Save *Terminal* output to a file.

Customize Appearance

Change cursor
Select different cursor style.

*Terminal* sizes
Change the *Terminal* window size.

Change font and style

Windows and tabs

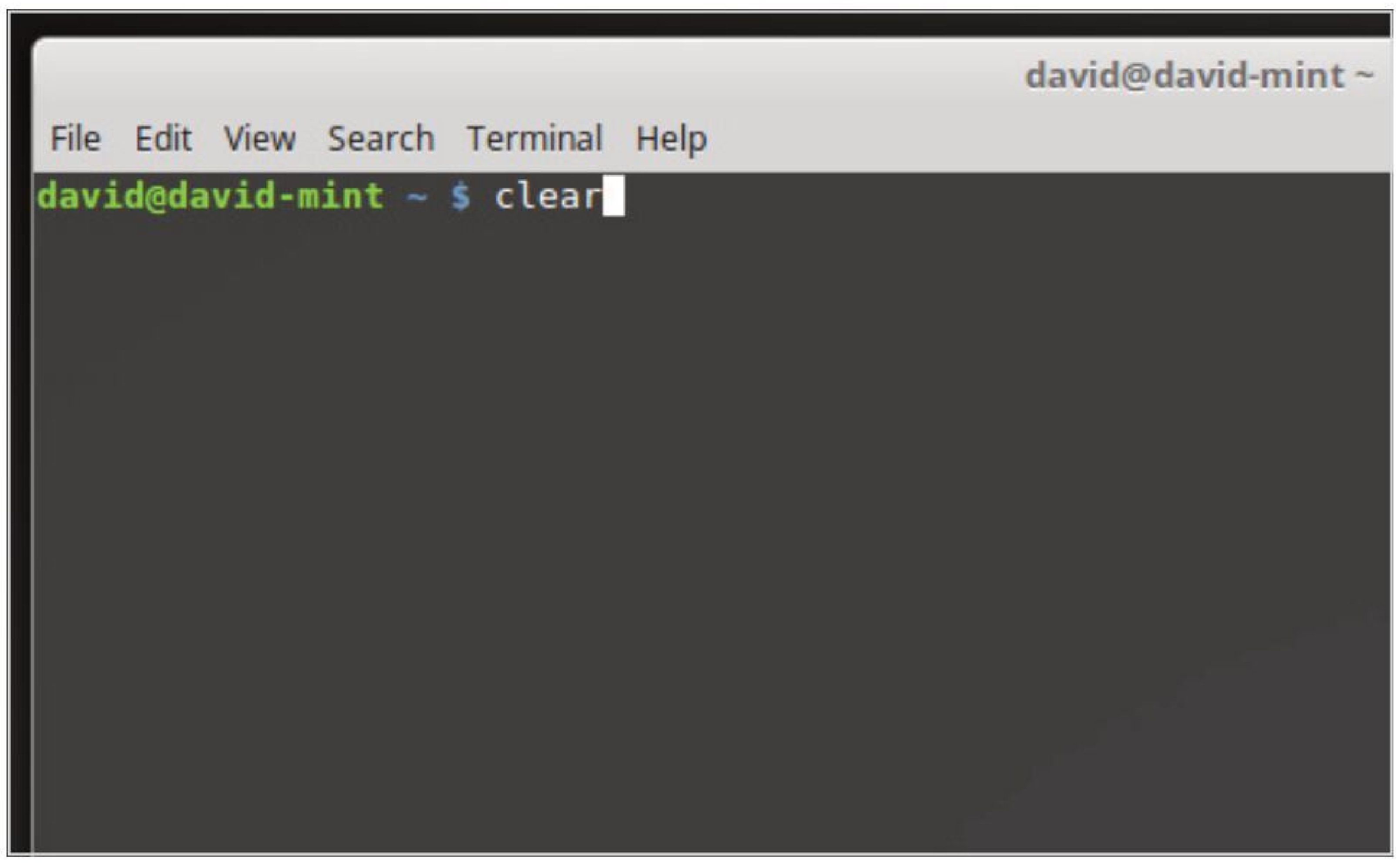
# Update Mint via the Terminal

Up to now you've been using the shield icon to launch Mint Update Manager in order to update the system and upgrade the currently installed apps, tools and other elements. However, you can also accomplish a complete system update and upgrade from the Terminal.

## USING APT-GET

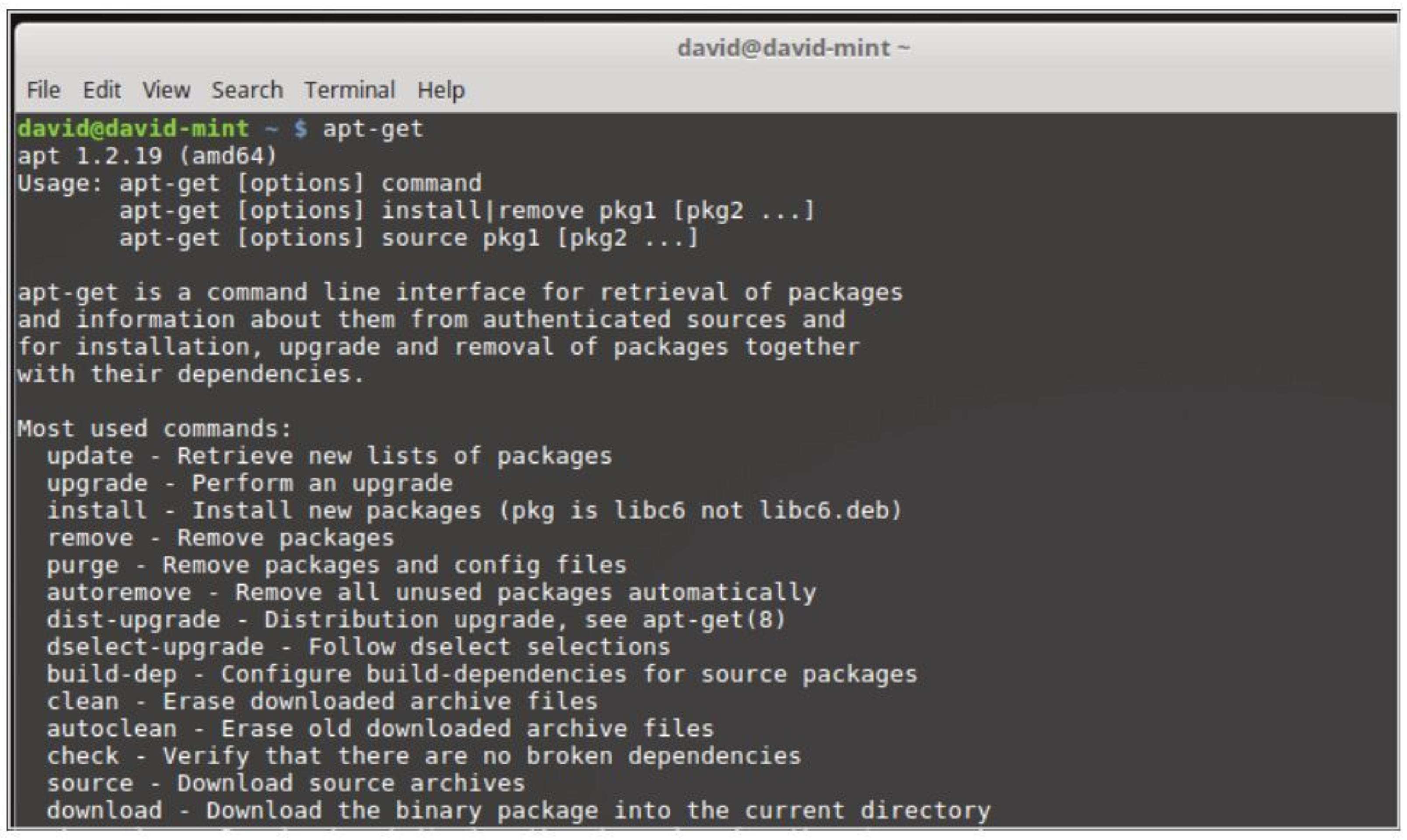
**To update and upgrade via the Terminal you use the APT (Advanced Packaging Tool) command. It's a powerful command and combines different elements depending on its use.**

**STEP 1** Start by opening a new Terminal or if you already have one opened clear its contents with the clear command. This starts you off with a clean slate on which to work.



```
david@david-mint ~ $ clear
```

**STEP 2** Enter: `apt-get` into the Terminal. This brings up a list of the most used apt-get commands, along with a brief description of what the command does. It's worth having a look at, even if it doesn't make a huge amount of sense at this time.

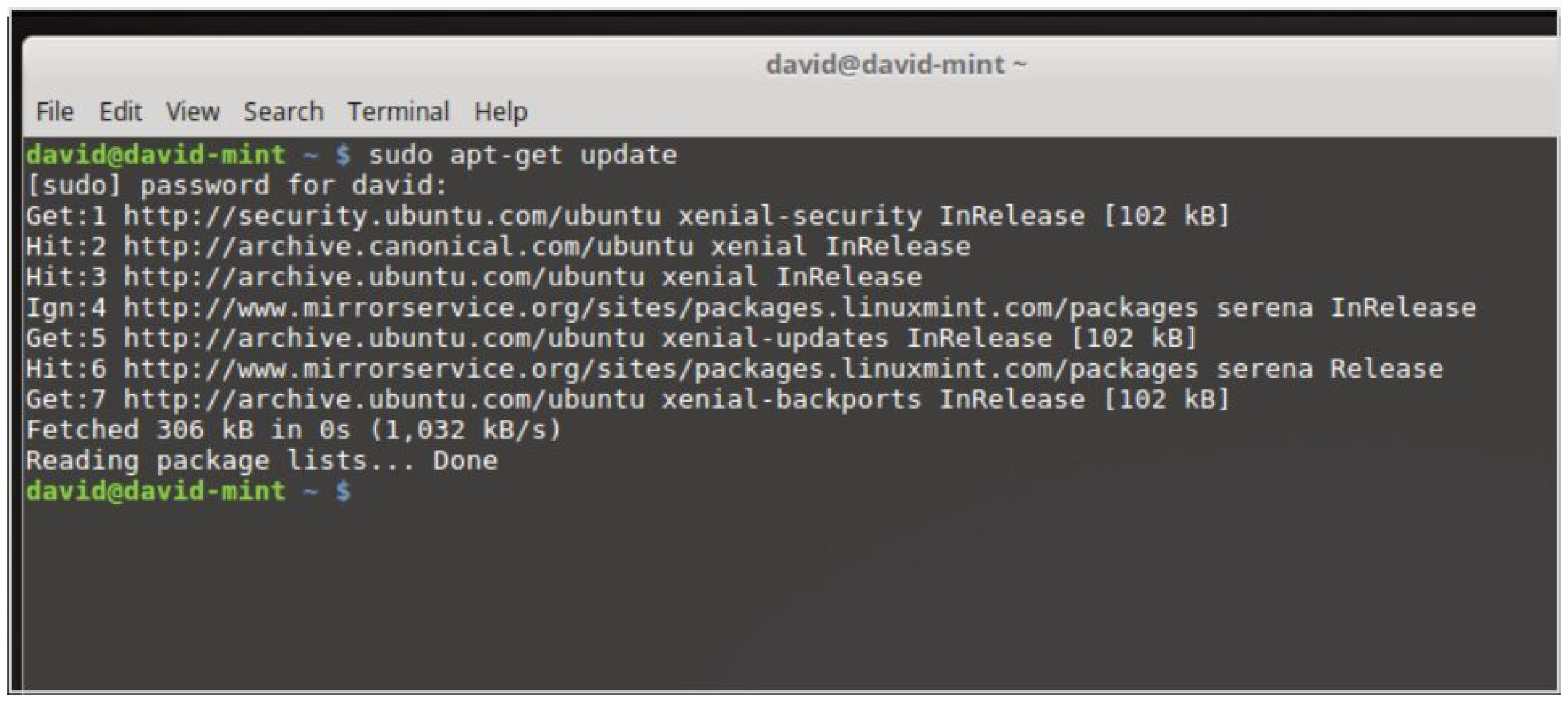


```
david@david-mint ~ $ apt-get
apt 1.2.19 (amd64)
Usage: apt-get [options] command
       apt-get [options] install|remove pkg1 [pkg2 ...]
       apt-get [options] source pkg1 [pkg2 ...]

apt-get is a command line interface for retrieval of packages
and information about them from authenticated sources and
for installation, upgrade and removal of packages together
with their dependencies.

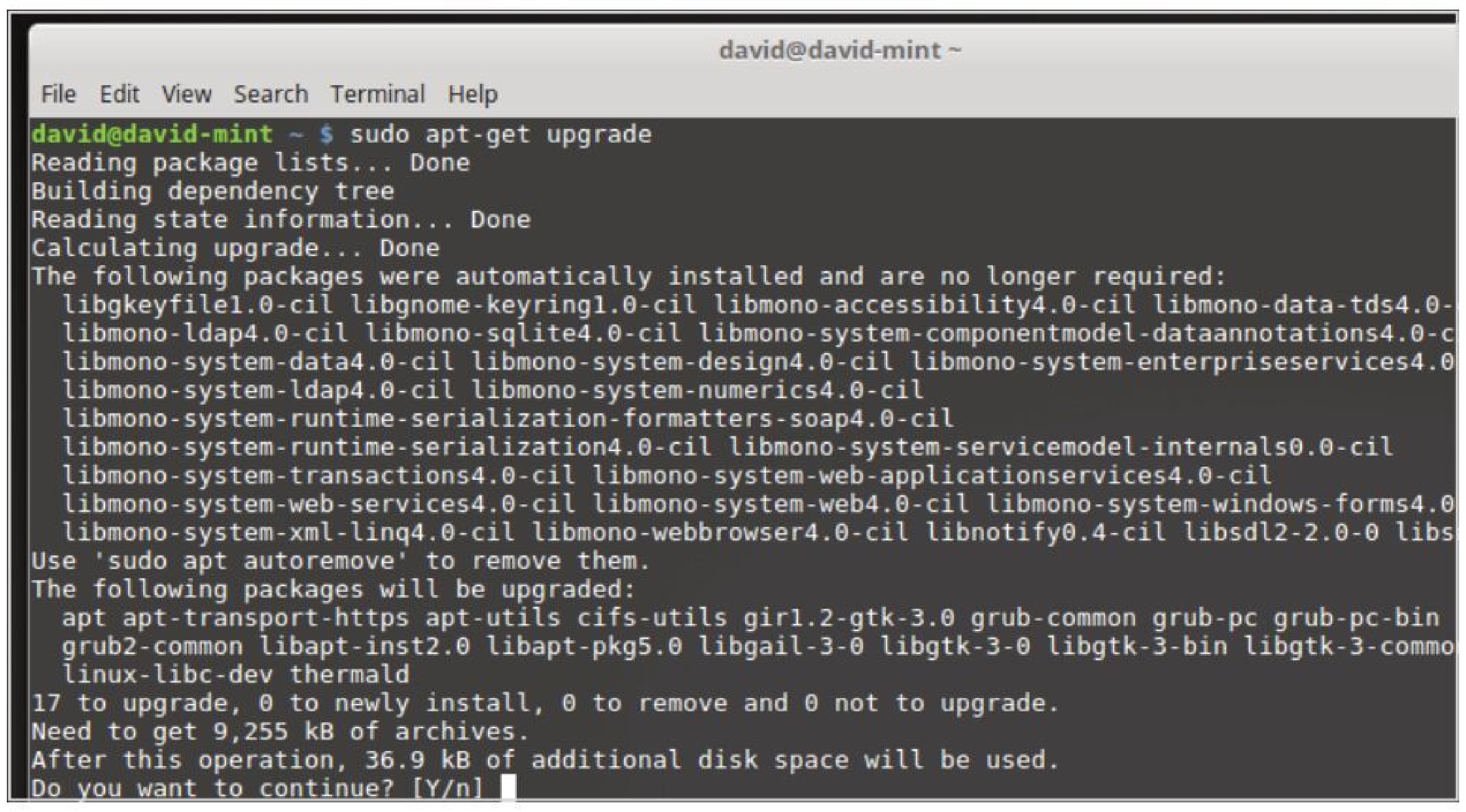
Most used commands:
  update - Retrieve new lists of packages
  upgrade - Perform an upgrade
  install - Install new packages (pkg is libc6 not libc6.deb)
  remove - Remove packages
  purge - Remove packages and config files
  autoremove - Remove all unused packages automatically
  dist-upgrade - Distribution upgrade, see apt-get(8)
  dselect-upgrade - Follow dselect selections
  build-dep - Configure build-dependencies for source packages
  clean - Erase downloaded archive files
  autoclean - Erase old downloaded archive files
  check - Verify that there are no broken dependencies
  source - Download source archives
  download - Download the binary package into the current directory
```

**STEP 3** Apt-get is used to update and upgrade the software in Mint, as well as Ubuntu and other Debian-based distros. Using the Update element retrieves new package lists and updates the list of source files. Upgrade downloads and performs an upgrade to the latest versions of those files. To start the entire Upgrade and Update process, enter: `sudo apt-get update`, followed by your password.



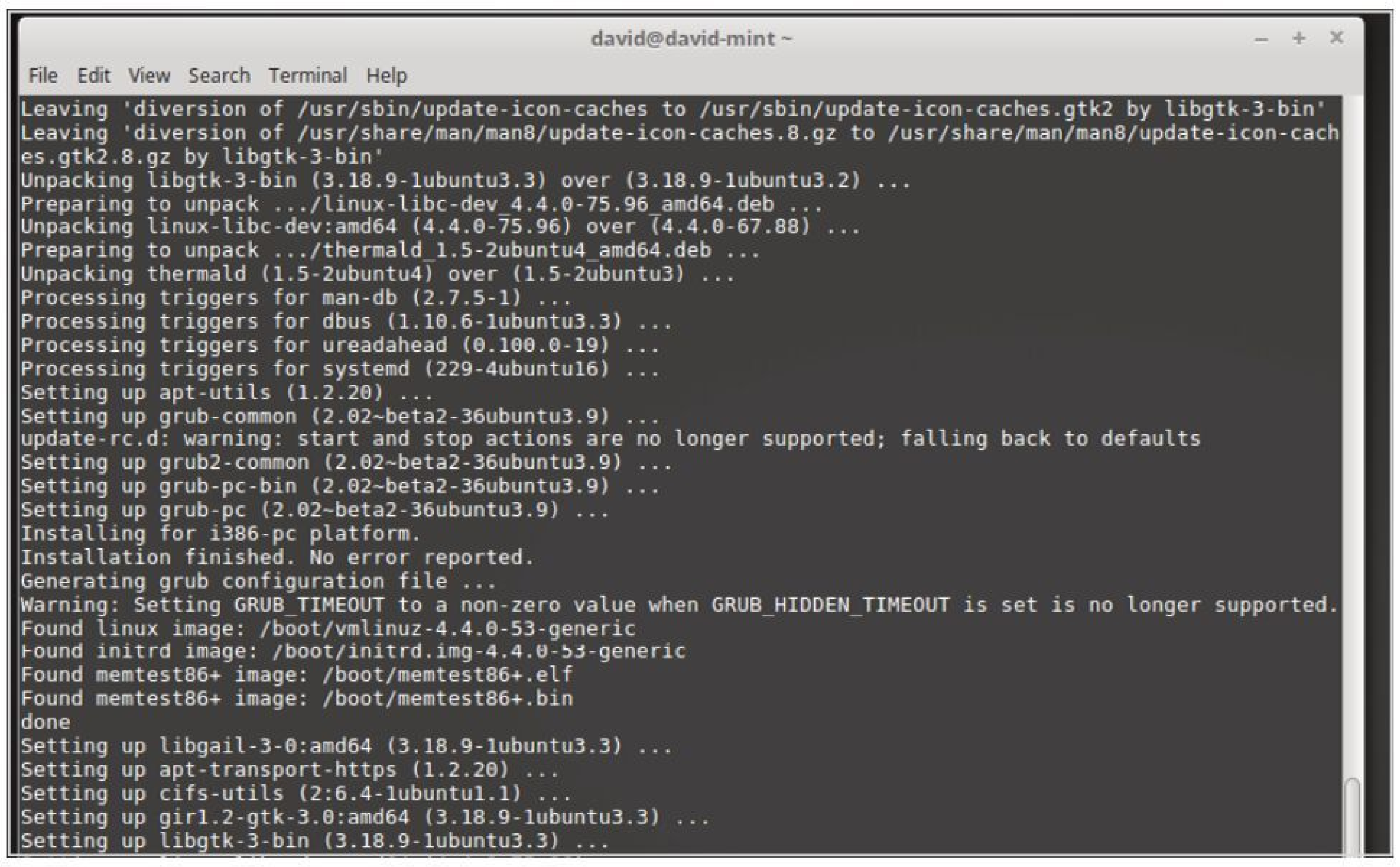
```
david@david-mint ~ $ sudo apt-get update
[sudo] password for david:
Get:1 http://security.ubuntu.com/ubuntu xenial-security InRelease [102 kB]
Hit:2 http://archive.canonical.com/ubuntu xenial InRelease
Hit:3 http://archive.ubuntu.com/ubuntu xenial InRelease
Ign:4 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena InRelease
Get:5 http://archive.ubuntu.com/ubuntu xenial-updates InRelease [102 kB]
Hit:6 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena Release
Get:7 http://archive.ubuntu.com/ubuntu xenial-backports InRelease [102 kB]
Fetched 306 kB in 0s (1,032 kB/s)
Reading package lists... Done
david@david-mint ~ $
```

**STEP 4** Notice now the addition of the sudo command. The sudo command once meant Super User Do; these days it's more acceptable as Substitute User Do. It means that the administrative user (Super User) uses APT (Advanced Packaging Tool) to Get any Updates. Now try this: `sudo apt-get upgrade`.



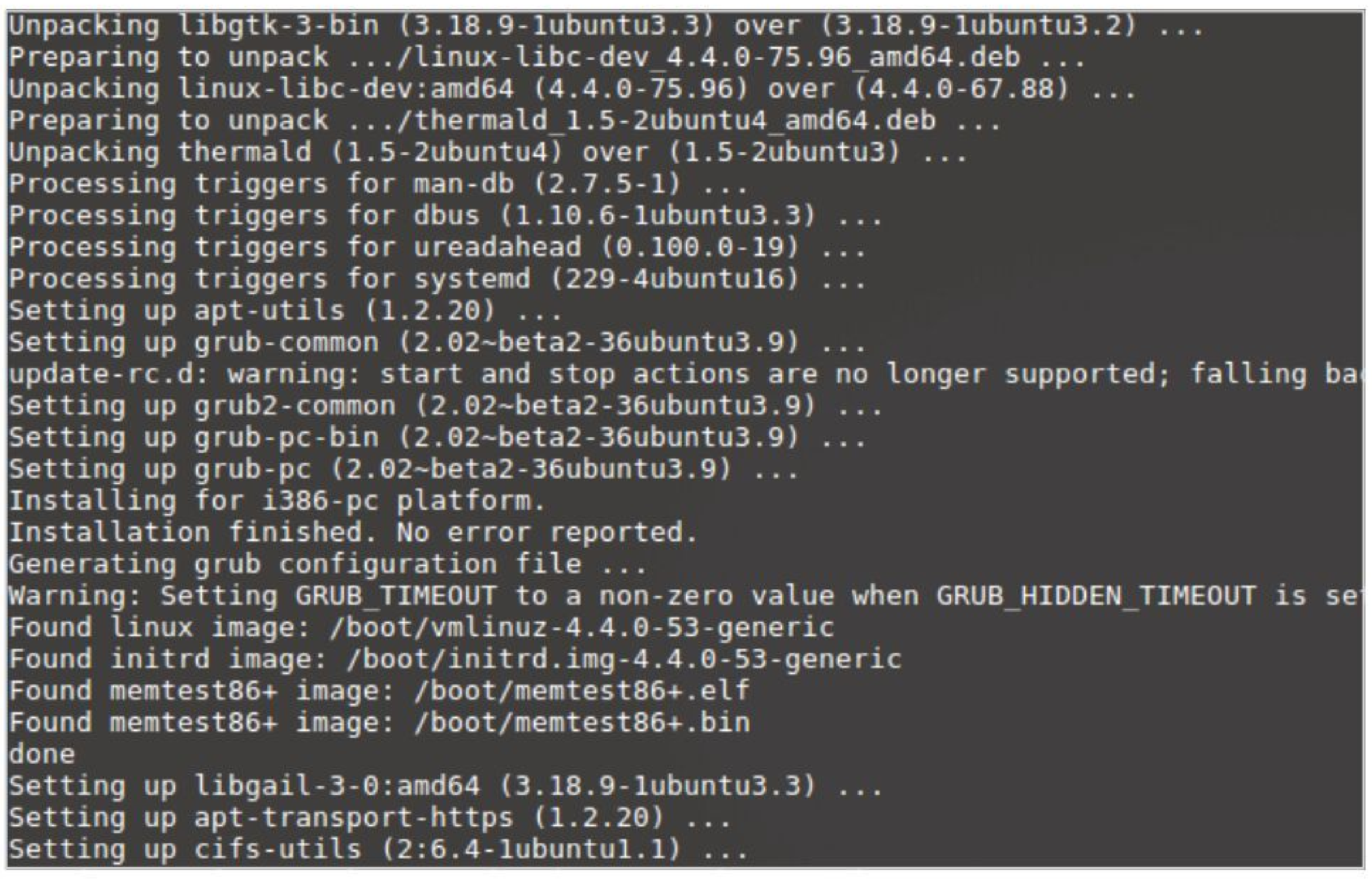
```
david@david-mint ~ $ sudo apt-get upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  libgkeyfile1.0-cil libgnome-keyring1.0-cil libmono-accessibility4.0-cil libmono-data-tds4.0-
  libmono-ldap4.0-cil libmono-sqlite4.0-cil libmono-system-componentmodel-dataannotations4.0-c
  libmono-system-data4.0-cil libmono-system-design4.0-cil libmono-system-enterpriseservices4.0
  libmono-system-ldap4.0-cil libmono-system-numerics4.0-cil
  libmono-system-runtime-serialization-formatters-soap4.0-cil
  libmono-system-runtime-serialization4.0-cil libmono-system-servicemodel-internals0.0-cil
  libmono-system-transactions4.0-cil libmono-system-web-applicationservices4.0-cil
  libmono-system-web-services4.0-cil libmono-system-web4.0-cil libmono-system-windows-forms4.0
  libmono-system-xml-linq4.0-cil libmono-webbrowser4.0-cil libnotify0.4-cil libsdl2-2.0-0 libs
Use 'sudo apt autoremove' to remove them.
The following packages will be upgraded:
  apt apt-transport-https apt-utils cifs-utils gir1.2-gtk-3.0 grub-common grub-pc grub-pc-bin
  grub2-common libapt-inst2.0 libapt-pkg5.0 libgail-3-0 libgtk-3-0 libgtk-3-bin libgtk-3-commo
  linux-libc-dev thermald
17 to upgrade, 0 to newly install, 0 to remove and 0 not to upgrade.
Need to get 9,255 kB of archives.
After this operation, 36.9 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

**STEP 5** Depending on the state of your updates, if you have any waiting to be installed, you might be asked if you want to apply the results of the `sudo apt-get upgrade` command. You can press y to accept and continue. What's happening here is that apt-get has some updated software to apply to Mint, and you're okaying the action.



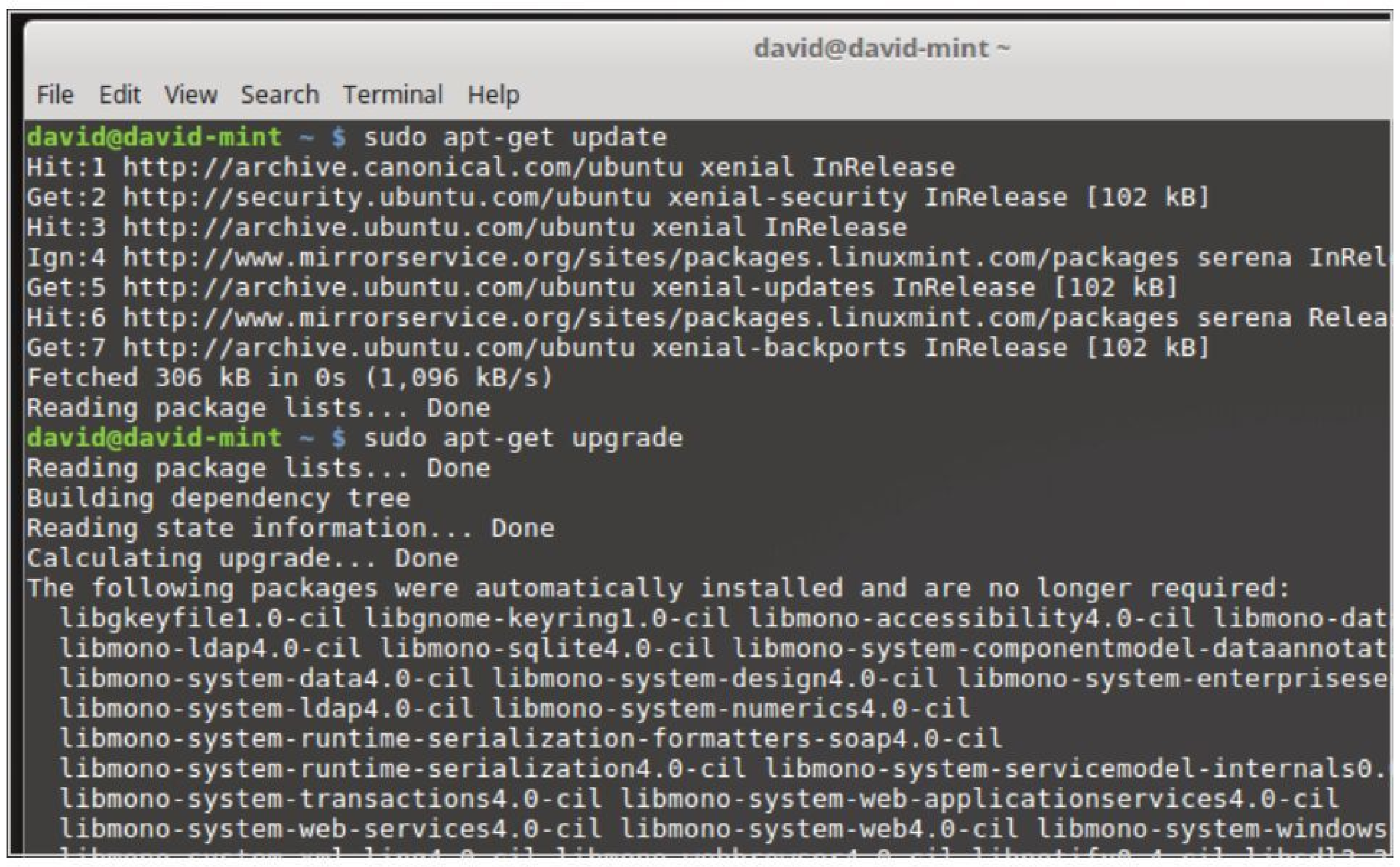
```
Leaving 'diversion of /usr/sbin/update-icon-caches to /usr/sbin/update-icon-caches.gtk2 by libgtk-3-bin'
Leaving 'diversion of /usr/share/man/man8/update-icon-caches.8.gz to /usr/share/man/man8/update-icon-cach
es.gtk2.8.gz by libgtk-3-bin'
Unpacking libgtk-3-bin (3.18.9-1ubuntu3.3) over (3.18.9-1ubuntu3.2) ...
Preparing to unpack .../linux-libc-dev_4.4.0-75.96_amd64.deb ...
Unpacking linux-libc-dev:amd64 (4.4.0-75.96) over (4.4.0-67.88) ...
Preparing to unpack .../thermald_1.5-2ubuntu4_amd64.deb ...
Unpacking thermald (1.5-2ubuntu4) over (1.5-2ubuntu3) ...
Processing triggers for man-db (2.7.5-1) ...
Processing triggers for dbus (1.10.6-1ubuntu3.3) ...
Processing triggers for ureadahead (0.100.0-19) ...
Processing triggers for systemd (229-4ubuntu16) ...
Setting up apt-utils (1.2.20) ...
Setting up grub-common (2.02~beta2-36ubuntu3.9) ...
update-rc.d: warning: start and stop actions are no longer supported; falling back to defaults
Setting up grub2-common (2.02~beta2-36ubuntu3.9) ...
Setting up grub-pc-bin (2.02~beta2-36ubuntu3.9) ...
Setting up grub-pc (2.02~beta2-36ubuntu3.9) ...
Installing for i386-pc platform.
Installation finished. No error reported.
Generating grub configuration file ...
Warning: Setting GRUB_TIMEOUT to a non-zero value when GRUB_HIDDEN_TIMEOUT is set is no longer supported.
Found linux image: /boot/vmlinuz-4.4.0-53-generic
Found initrd image: /boot/initrd.img-4.4.0-53-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
Setting up libgail-3-0:amd64 (3.18.9-1ubuntu3.3) ...
Setting up apt-transport-https (1.2.20) ...
Setting up cifs-utils (2:6.4-1ubuntu1.1) ...
Setting up gir1.2-gtk-3.0:amd64 (3.18.9-1ubuntu3.3) ...
Setting up libgtk-3-bin (3.18.9-1ubuntu3.3) ...
```

**STEP 6** There's likely to be a long list of what seems gibberish now filling your Terminal window but don't worry. The files necessary for the upgrade have been downloaded, prepared, unpacked, processed, installed and set up correctly. There's a lot going on when you perform an upgrade, even with the smallest package.



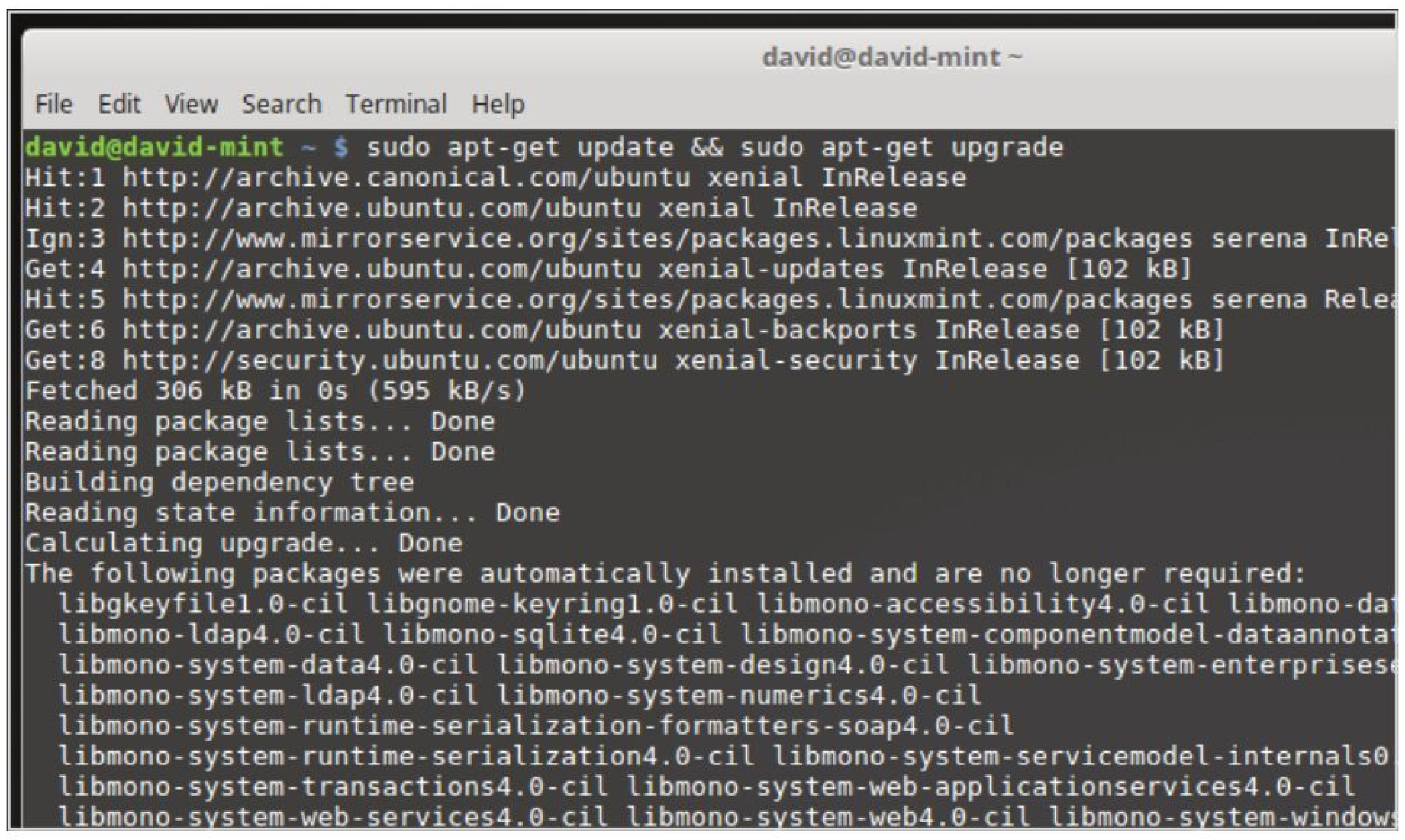
```
Unpacking libgtk-3-bin (3.18.9-1ubuntu3.3) over (3.18.9-1ubuntu3.2) ...
Preparing to unpack .../linux-libc-dev_4.4.0-75.96_amd64.deb ...
Unpacking linux-libc-dev:amd64 (4.4.0-75.96) over (4.4.0-67.88) ...
Preparing to unpack .../thermald_1.5-2ubuntu4_amd64.deb ...
Unpacking thermald (1.5-2ubuntu4) over (1.5-2ubuntu3) ...
Processing triggers for man-db (2.7.5-1) ...
Processing triggers for dbus (1.10.6-1ubuntu3.3) ...
Processing triggers for ureadahead (0.100.0-19) ...
Processing triggers for systemd (229-4ubuntu16) ...
Setting up apt-utils (1.2.20) ...
Setting up grub-common (2.02~beta2-36ubuntu3.9) ...
update-rc.d: warning: start and stop actions are no longer supported; falling ba
Setting up grub2-common (2.02~beta2-36ubuntu3.9) ...
Setting up grub-pc-bin (2.02~beta2-36ubuntu3.9) ...
Setting up grub-pc (2.02~beta2-36ubuntu3.9) ...
Installing for i386-pc platform.
Installation finished. No error reported.
Generating grub configuration file ...
Warning: Setting GRUB_TIMEOUT to a non-zero value when GRUB_HIDDEN_TIMEOUT is se
Found linux image: /boot/vmlinuz-4.4.0-53-generic
Found initrd image: /boot/initrd.img-4.4.0-53-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
Setting up libgail-3-0:amd64 (3.18.9-1ubuntu3.3) ...
Setting up apt-transport-https (1.2.20) ...
Setting up cifs-utils (2:6.4-1ubuntu1.1) ...
```

**STEP 7** Essentially, that's it, your system is now up to date according to the available list of packages from the apt-get update command. You can run through the process one more time, just to check if everything went okay. To recap, enter: `sudo apt-get update`, press `Enter`, then type: `sudo apt-get upgrade` and press `Enter`.



```
david@david-mint ~ $ sudo apt-get update
Hit:1 http://archive.canonical.com/ubuntu xenial InRelease
Get:2 http://security.ubuntu.com/ubuntu xenial-security InRelease [102 kB]
Hit:3 http://archive.ubuntu.com/ubuntu xenial InRelease
Ign:4 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena InRel
Get:5 http://archive.ubuntu.com/ubuntu xenial-updates InRelease [102 kB]
Hit:6 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena Relea
Get:7 http://archive.ubuntu.com/ubuntu xenial-backports InRelease [102 kB]
Fetched 306 kB in 0s (1,096 kB/s)
Reading package lists... Done
david@david-mint ~ $ sudo apt-get upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  libgkeyfile1.0-cil libgnome-keyring1.0-cil libmono-accessibility4.0-cil libmono-dat
  libmono-ldap4.0-cil libmono-sqlite4.0-cil libmono-system-componentmodel-dataannotat
  libmono-system-data4.0-cil libmono-system-design4.0-cil libmono-system-enterprisese
  libmono-system-ldap4.0-cil libmono-system-numerics4.0-cil
  libmono-system-runtime-serialization-formatters-soap4.0-cil
  libmono-system-runtime-serialization4.0-cil libmono-system-servicemodel-internals0.
  libmono-system-transactions4.0-cil libmono-system-web-applicationservices4.0-cil
  libmono-system-web-services4.0-cil libmono-system-web4.0-cil libmono-system-windows
```

**STEP 8** Interestingly, Linux Mint, among other distros, offers you the ability to chain several commands together. In this example, therefore, we can use `sudo apt-get update && sudo apt-get upgrade`. The double ampersand is what combines the commands and works perfectly, providing the preceding command went without a hitch. It's recommended to start any session with the update and upgrade combo.



```
david@david-mint ~ $ sudo apt-get update && sudo apt-get upgrade
Hit:1 http://archive.canonical.com/ubuntu xenial InRelease
Hit:2 http://archive.ubuntu.com/ubuntu xenial InRelease
Ign:3 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena InRel
Get:4 http://archive.ubuntu.com/ubuntu xenial-updates InRelease [102 kB]
Hit:5 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena Relea
Get:6 http://archive.ubuntu.com/ubuntu xenial-backports InRelease [102 kB]
Get:8 http://security.ubuntu.com/ubuntu xenial-security InRelease [102 kB]
Fetched 306 kB in 0s (595 kB/s)
Reading package lists... Done
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  libgkeyfile1.0-cil libgnome-keyring1.0-cil libmono-accessibility4.0-cil libmono-da
  libmono-ldap4.0-cil libmono-sqlite4.0-cil libmono-system-componentmodel-dataannota
  libmono-system-data4.0-cil libmono-system-design4.0-cil libmono-system-enterprises
  libmono-system-ldap4.0-cil libmono-system-numerics4.0-cil
  libmono-system-runtime-serialization-formatters-soap4.0-cil
  libmono-system-runtime-serialization4.0-cil libmono-system-servicemodel-internals0
  libmono-system-transactions4.0-cil libmono-system-web-applicationservices4.0-cil
  libmono-system-web-services4.0-cil libmono-system-web4.0-cil libmono-system-window
```

## TERMINAL VS UPDATE MANAGER?

Why use the Terminal to update and upgrade over the Update Manager, regardless of the distro you're using? Some users greatly prefer using the Terminal to update their Linux systems and accompanying apps, in the belief that it's better. However, that's not often the case.

Using the Terminal, apt-get upgrade, doesn't handle changing dependencies between versions of packages, so if a package has its dependent files changed from one version to another, then the upgrade is held back.

The Update Manager, or Software Manager (depending on the distro), often phases its updates and marks those packages with changed dependencies for updating. However, and this is where Linux can often get confusing, sometimes it doesn't.

It all boils down to the developer of the package being updated and the way the package is held in the distro's repositories and whether the update is classified as stable or not. In essence, from the point of view of the user, if you update and upgrade using both the Terminal and the Update Manager regularly, then you will be as up to date as possible, and get the essential and necessary stable versions of the packages and core software. If you're looking for cutting edge package updates, then it's best to opt for a rolling release distro instead.

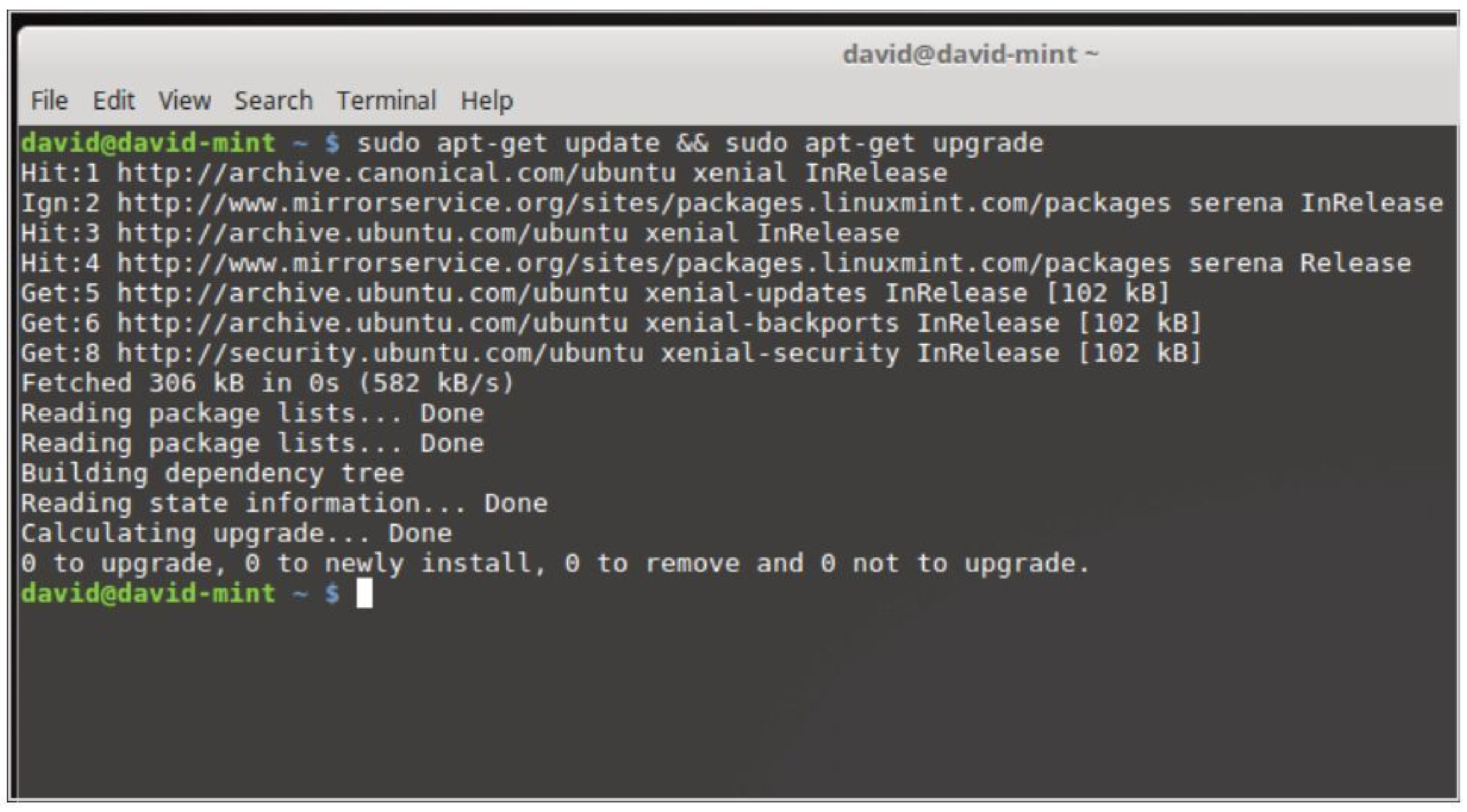
# Install Apps via the Terminal – Part 1

There are different ways to install apps and programs on Linux. You can opt for the graphical route, using a Software Manager, or you can use the Terminal. Often, the Terminal provides better control over the software being installed and sometimes, you have no choice in the matter.

## COMMAND LINE INSTALLS

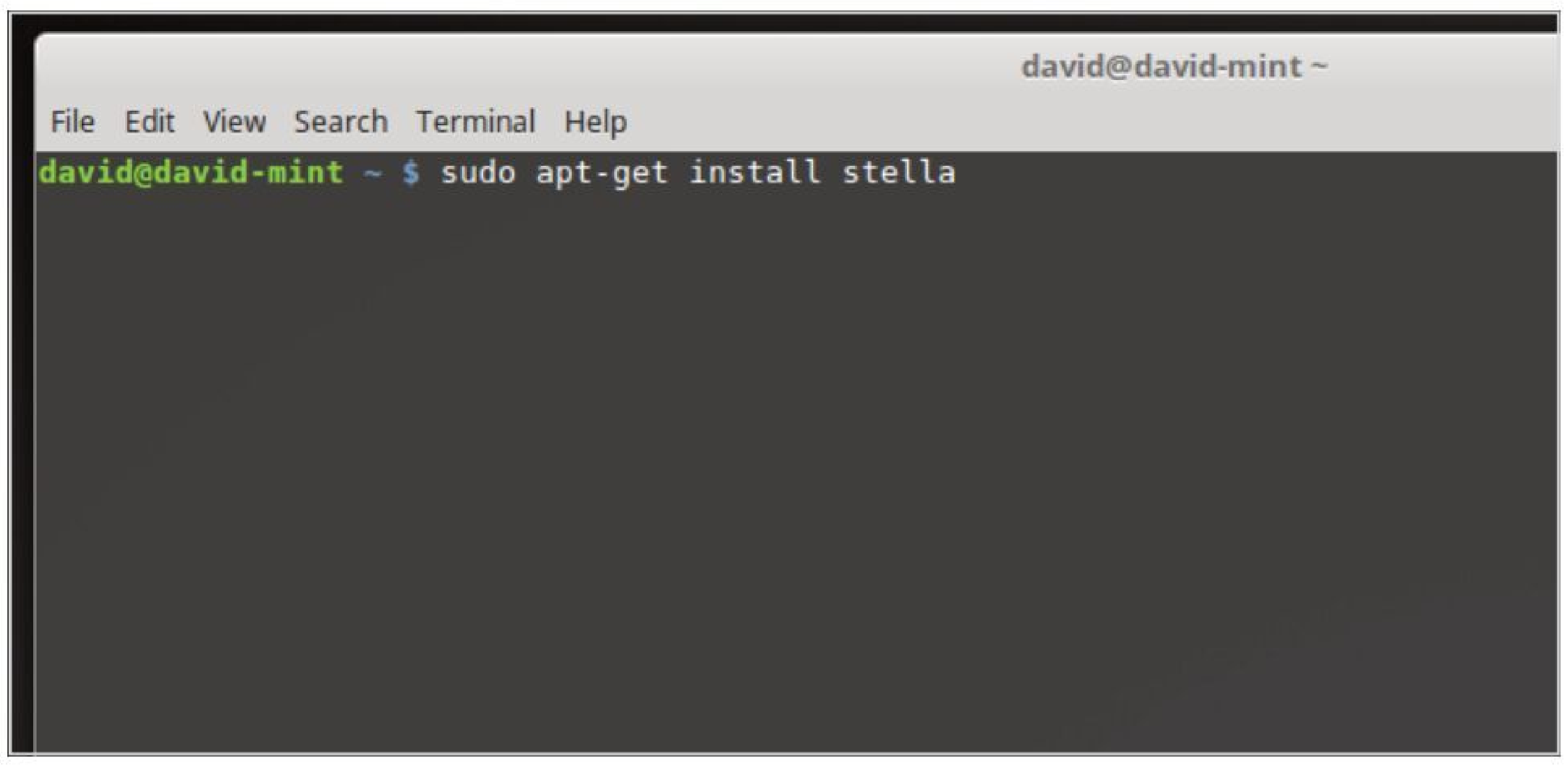
**Installing an app with the Terminal may require some nifty keyboard work but you get a better sense of what's being installed and where.**

**STEP 1** Installing apps form the Terminal is often relatively simple. First though, you need to make sure that the system is up to date. To do this open up the Terminal and enter: `sudo apt-get update && sudo apt-get upgrade`. Enter your password and accept any necessary updates.



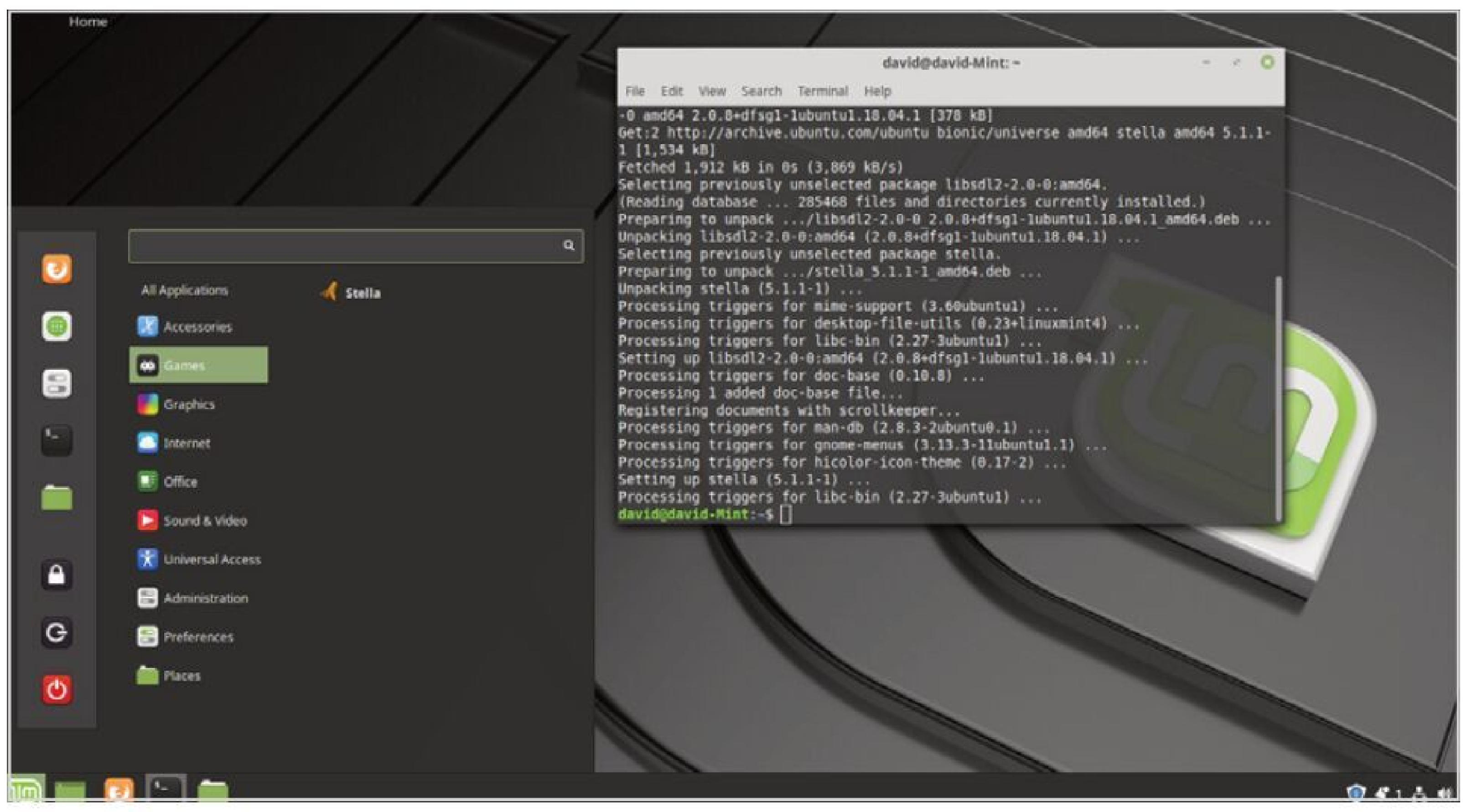
```
david@david-mint ~ $ sudo apt-get update && sudo apt-get upgrade
Hit:1 http://archive.canonical.com/ubuntu xenial InRelease
Ign:2 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena InRelease
Hit:3 http://archive.ubuntu.com/ubuntu xenial InRelease
Hit:4 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena Release
Get:5 http://archive.ubuntu.com/ubuntu xenial-updates InRelease [102 kB]
Get:6 http://archive.ubuntu.com/ubuntu xenial-backports InRelease [102 kB]
Get:8 http://security.ubuntu.com/ubuntu xenial-security InRelease [102 kB]
Fetched 306 kB in 0s (582 kB/s)
Reading package lists... Done
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
0 to upgrade, 0 to newly install, 0 to remove and 0 not to upgrade.
david@david-mint ~ $
```

**STEP 2** Just as you've seen, sudo apt-get update/upgrade and so on are designed to upgrade the software that's already installed on the system. How do you install more apps though? It just so happens that it's extraordinarily simple. First you need an app to install, so let's use Stella again. Enter: `sudo apt-get install stella`.



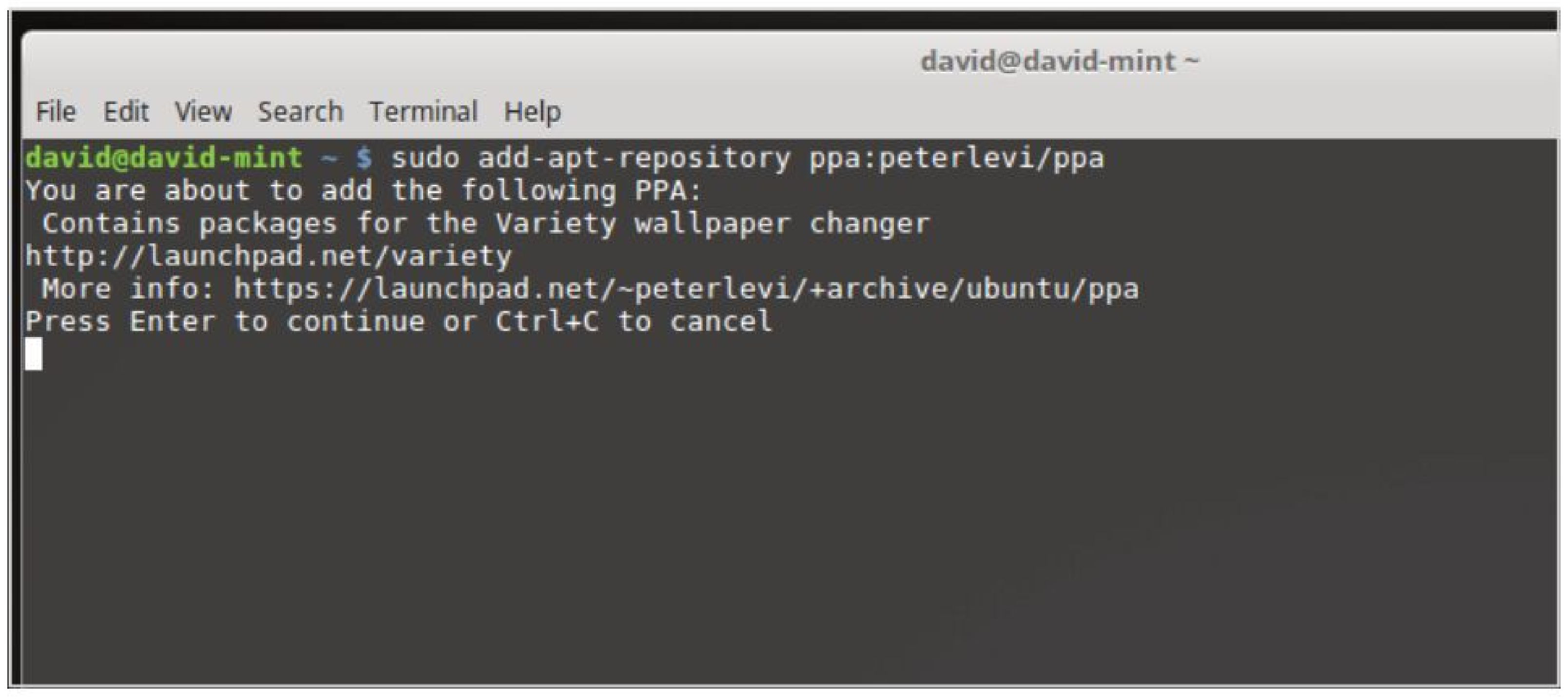
```
david@david-mint ~ $ sudo apt-get install stella
```

**STEP 3** You need to enter y to confirm the installation, which takes up around 5.5MB of storage in the system. Once Stella is installed, you can see again that Mint has automatically created the Games category in the Menu as well as the app shortcut.



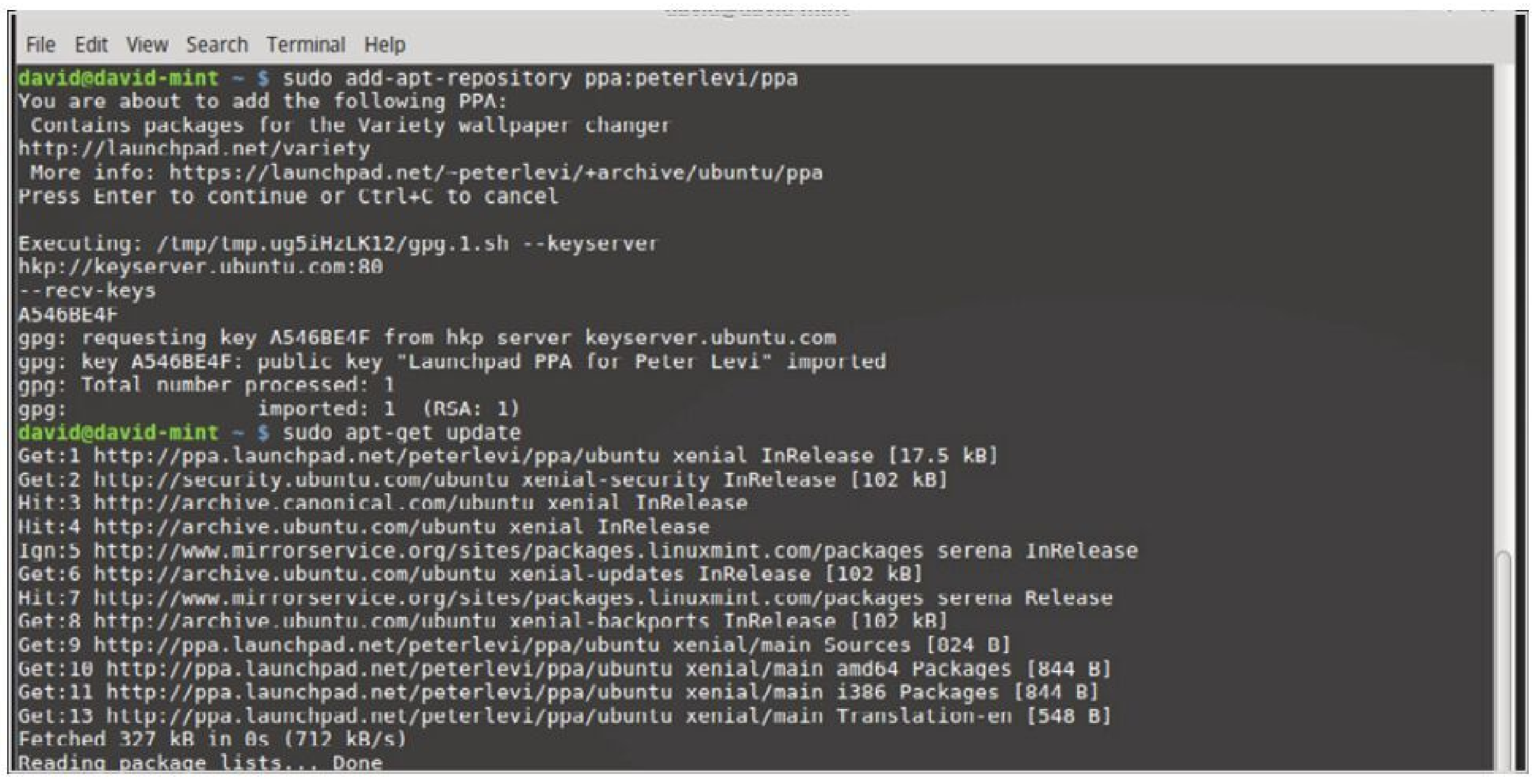
```
-0 amd64 2.0.8+dfsg1-1ubuntu1.18.04.1 [378 kB]
Get:2 http://archive.ubuntu.com/ubuntu bionic/universe amd64 stella amd64 5.1.1-
1 [1,534 kB]
Fetched 1,912 kB in 0s (3,869 kB/s)
Selecting previously unselected package libsdl2-2.0-0:amd64.
(Reading database ... 285468 files and directories currently installed.)
Preparing to unpack .../libsdl2-2.0-0_2.0.8+dfsg1-1ubuntu1.18.04.1_amd64.deb ...
Unpacking libsdl2-2.0-0:amd64 (2.0.8+dfsg1-1ubuntu1.18.04.1) ...
Selecting previously unselected package stella.
Preparing to unpack .../stella_5.1.1-1_amd64.deb ...
Unpacking stella (5.1.1-1) ...
Processing triggers for mime-support (3.60ubuntu1) ...
Processing triggers for desktop-file-utils (0.23+linuxmint4) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Setting up libsdl2-2.0-0:amd64 (2.0.8+dfsg1-1ubuntu1.18.04.1) ...
Processing triggers for doc-base (0.10.8) ...
Processing 1 added doc-base file...
Registering documents with scrollkeeper...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for gnome-menus (3.13.3-11ubuntu1.1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Setting up stella (5.1.1-1) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
david@david-Mint:~$
```

**STEP 4** Sometimes, when installing software, you need to add the app's Repository. The repository, or repo, is simply the remote server location where the software is held, along with all its dependencies (the vital libraries and such it needs to function). Start by typing in this: `sudo add-apt-repository ppa:peterlevi/ppa`. Press Enter when asked to and add the PPA (Personal Package Archive).



```
david@david-mint ~ $ sudo add-apt-repository ppa:peterlevi/ppa
You are about to add the following PPA:
 Contains packages for the Variety wallpaper changer
http://launchpad.net/variety
 More info: https://launchpad.net/~peterlevi/+archive/ubuntu/ppa
Press Enter to continue or Ctrl+C to cancel
```

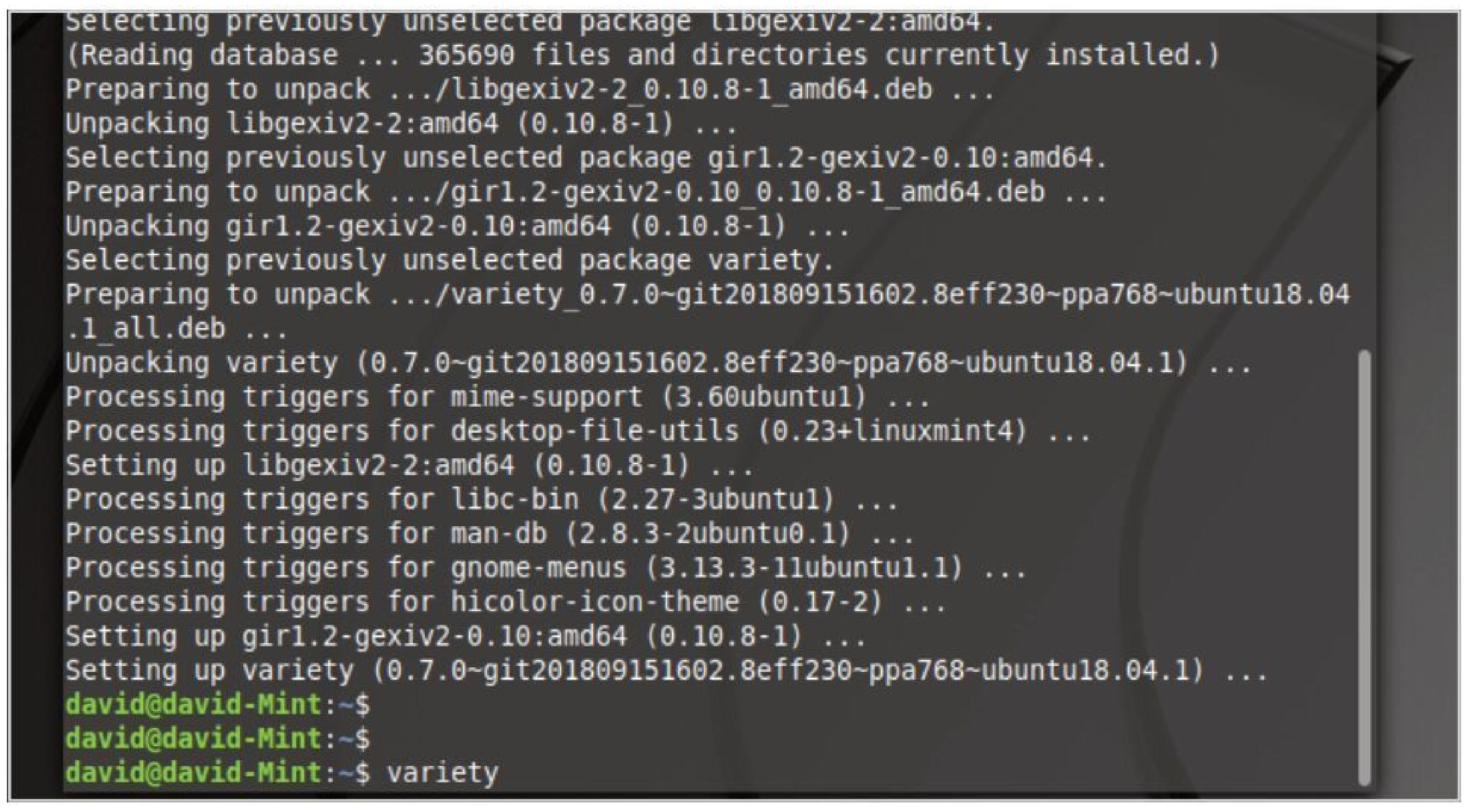
**STEP 5** This adds the repo for the app Variety Wallpaper Changer, an Ubuntu-based app that works in Mint and changes the wallpaper automatically. Now that the repo is added, enter: `sudo apt-get update`, to update the new information and add the contents of the repo to the package database.



```
david@david-mint ~ $ sudo add-apt-repository ppa:peterlevi/ppa
You are about to add the following PPA:
 Contains packages for the Variety wallpaper changer
http://launchpad.net/variety
 More info: https://launchpad.net/~peterlevi/+archive/ubuntu/ppa
Press Enter to continue or Ctrl+C to cancel

Executing: /tmp/tmp.ug5iHzLK12/gpg.1.sh --keyserver
hkp://keyserver.ubuntu.com:80
--recv-keys
A546BE4F
gpg: requesting key A546BE4F from hkp server keyserver.ubuntu.com
gpg: key A546BE4F: public key "Launchpad PPA for Peter Levi" imported
gpg: Total number processed: 1
gpg:               imported: 1  (RSA: 1)
david@david-mint ~ $ sudo apt-get update
Get:1 http://ppa.launchpad.net/peterlevi/ppa/ubuntu xenial InRelease [17.5 kB]
Get:2 http://security.ubuntu.com/ubuntu xenial-security InRelease [102 kB]
Hit:3 http://archive.canonical.com/ubuntu xenial InRelease
Hit:4 http://archive.ubuntu.com/ubuntu xenial InRelease
Ign:5 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena InRelease
Get:6 http://archive.ubuntu.com/ubuntu xenial-updates InRelease [102 kB]
Hit:7 http://www.mirrorservice.org/sites/packages.linuxmint.com/packages serena Release
Get:8 http://archive.ubuntu.com/ubuntu xenial-backports InRelease [102 kB]
Get:9 http://ppa.launchpad.net/peterlevi/ppa/ubuntu xenial/main Sources [824 B]
Get:10 http://ppa.launchpad.net/peterlevi/ppa/ubuntu xenial/main amd64 Packages [844 B]
Get:11 http://ppa.launchpad.net/peterlevi/ppa/ubuntu xenial/main i386 Packages [844 B]
Get:13 http://ppa.launchpad.net/peterlevi/ppa/ubuntu xenial/main Translation-en [548 B]
Fetched 327 kB in 0s (712 kB/s)
Reading package lists... Done
```

**STEP 6** Now to install Variety, enter: `sudo apt-get install variety`. Press y to confirm and accept the installation, and to continue with the install. Once installed, you can type `variety` into the Terminal to run the app.

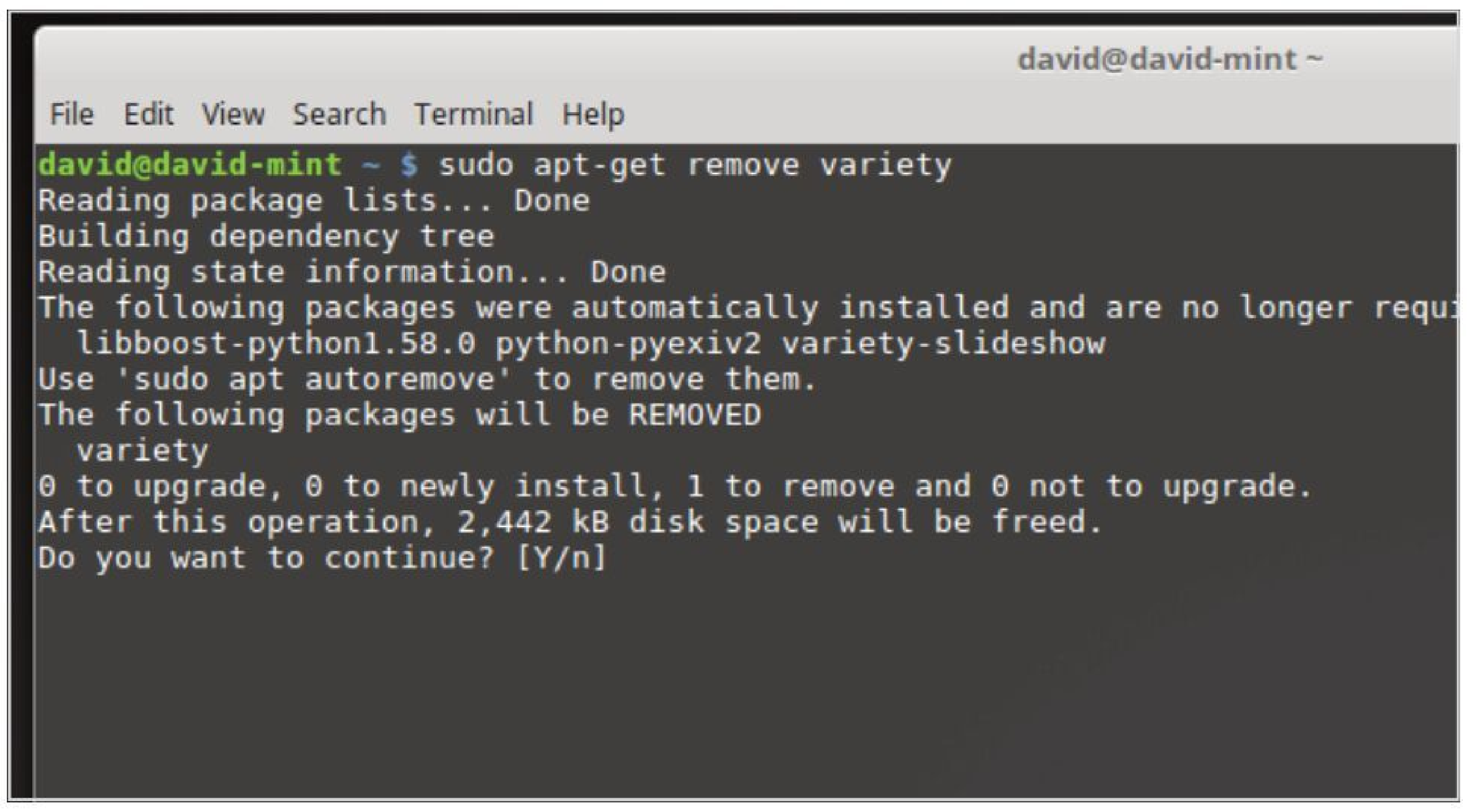


```
Selecting previously unselected package libgexiv2-2:amd64.
(Reading database ... 365690 files and directories currently installed.)
Preparing to unpack .../libgexiv2-2_0.10.8-1_amd64.deb ...
Unpacking libgexiv2-2:amd64 (0.10.8-1) ...
Selecting previously unselected package gir1.2-gexiv2-0.10:amd64.
Preparing to unpack .../gir1.2-gexiv2-0.10_0.10.8-1_amd64.deb ...
Unpacking gir1.2-gexiv2-0.10:amd64 (0.10.8-1) ...
Selecting previously unselected package variety.
Preparing to unpack .../variety_0.7.0~git201809151602.8eff230~ppa768~ubuntu18.04
.1_all.deb ...
Unpacking variety (0.7.0~git201809151602.8eff230~ppa768~ubuntu18.04.1) ...
Processing triggers for mime-support (3.60ubuntu1) ...
Processing triggers for desktop-file-utils (0.23+linuxmint4) ...
Setting up libgexiv2-2:amd64 (0.10.8-1) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for gnome-menus (3.13.3-11ubuntu1.1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Setting up gir1.2-gexiv2-0.10:amd64 (0.10.8-1) ...
Setting up variety (0.7.0~git201809151602.8eff230~ppa768~ubuntu18.04.1) ...
david@david-Mint:~$
david@david-Mint:~$
david@david-Mint:~$ variety
```

## REMOVING APPS

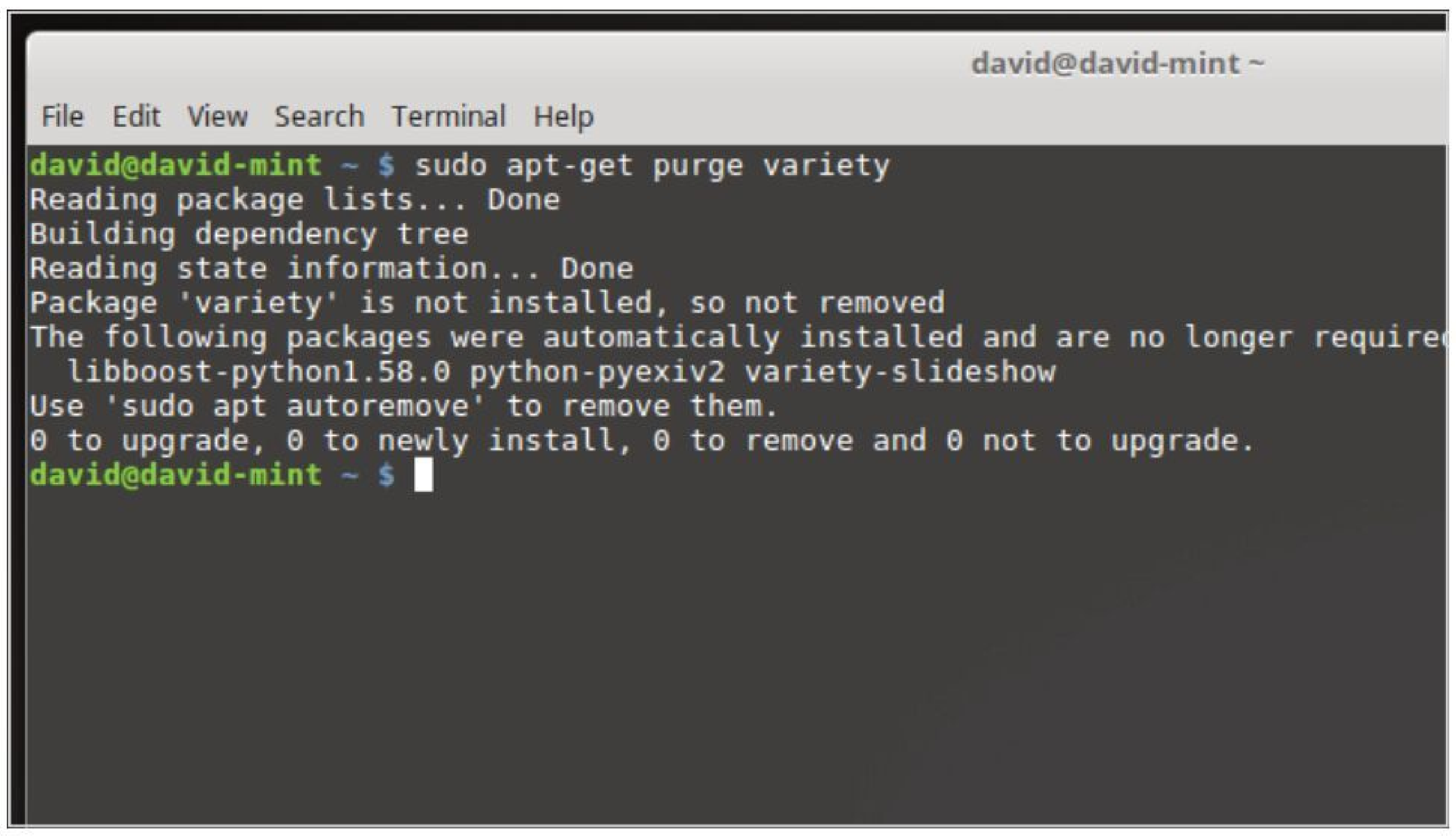
**In addition to installing apps, the apt command can also be used to remove any apps and helps keep the system tidy and free up resources.**

**STEP 1** To uninstall, or remove, the Variety app enter the following: `sudo apt-get remove variety`. Enter y to continue with the uninstall of the app; notice also that you're informed of how much space you're freeing up on the hard drive as a result of removing the app.



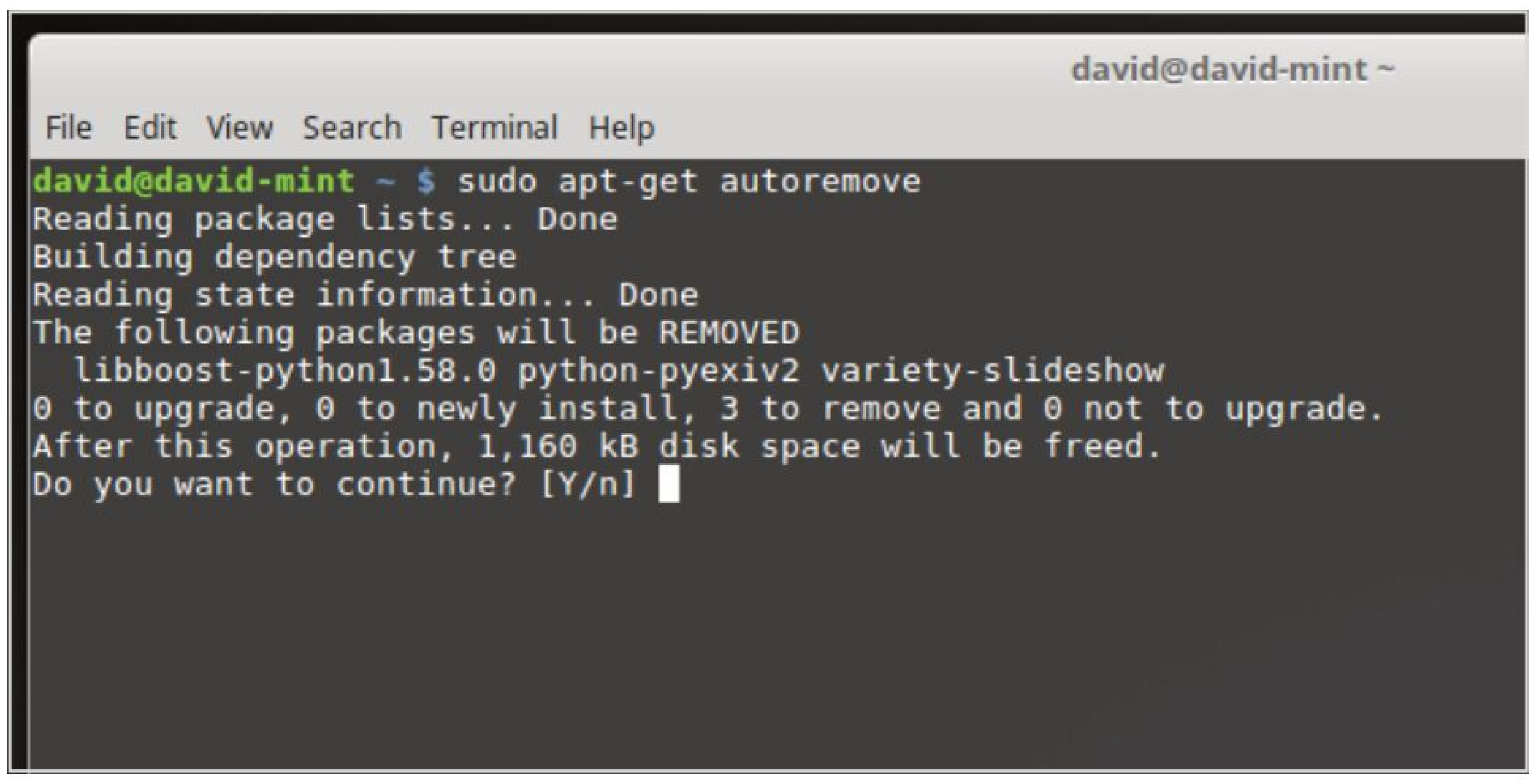
```
david@david-mint ~ $ sudo apt-get remove variety
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer requi
  libboost-python1.58.0 python-pyexiv2 variety-slideshow
Use 'sudo apt autoremove' to remove them.
The following packages will be REMOVED
  variety
0 to upgrade, 0 to newly install, 1 to remove and 0 not to upgrade.
After this operation, 2,442 kB disk space will be freed.
Do you want to continue? [Y/n]
```

**STEP 2** While the 'apt-get remove' command uninstalls an app, it doesn't get rid of the extra clutter that comes with an app, such as configuration and library files. To completely remove the clutter, enter: `sudo apt-get purge variety`.



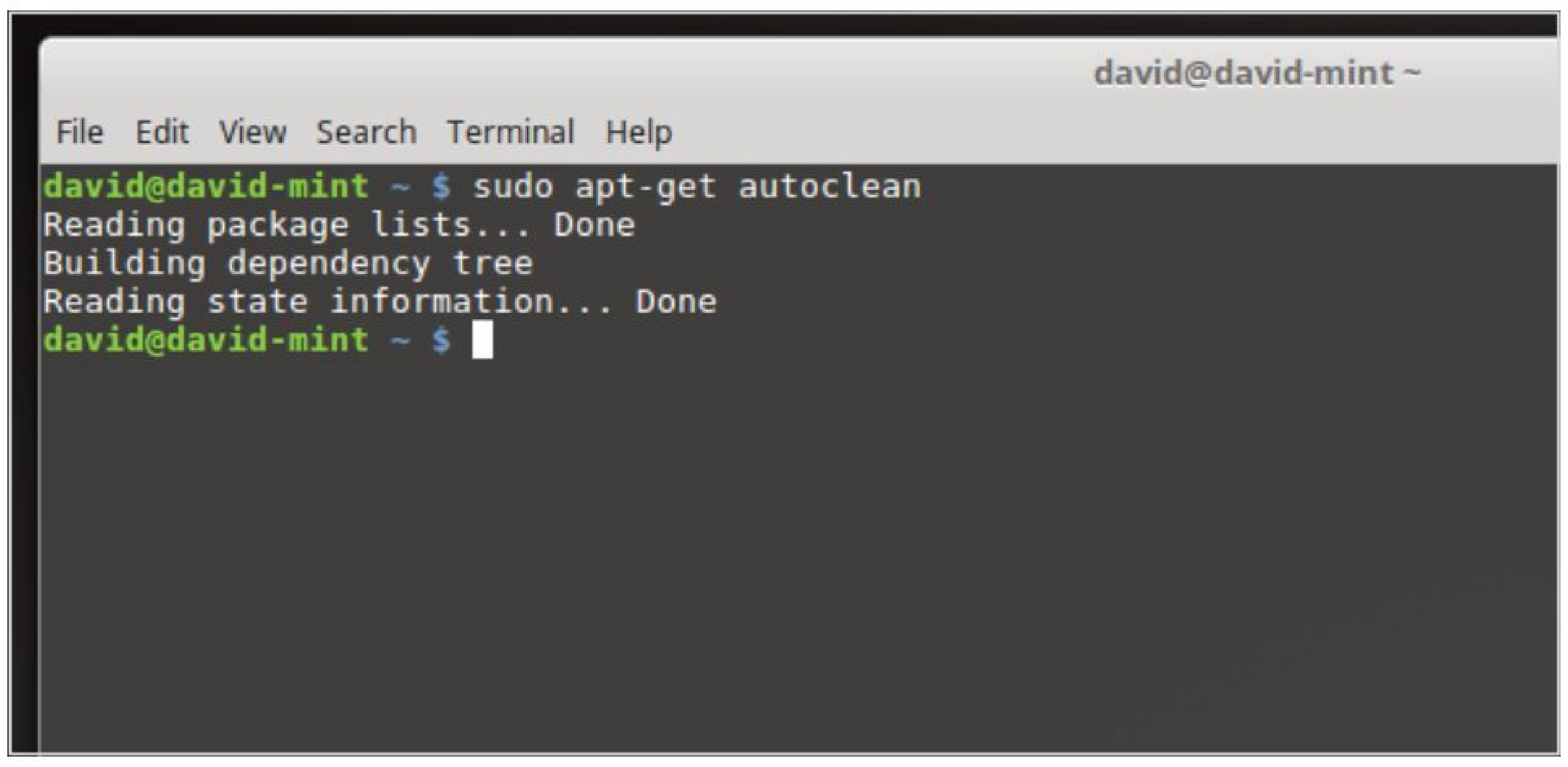
```
david@david-mint ~ $ sudo apt-get purge variety
Reading package lists... Done
Building dependency tree
Reading state information... Done
Package 'variety' is not installed, so not removed
The following packages were automatically installed and are no longer require
  libboost-python1.58.0 python-pyexiv2 variety-slideshow
Use 'sudo apt autoremove' to remove them.
0 to upgrade, 0 to newly install, 0 to remove and 0 not to upgrade.
david@david-mint ~ $ █
```

**STEP 3** When you remove apps from the system you're be informed that some packages that were automatically installed are no longer required. You already saw in the previous tutorial, that you can tidy things up with the following command: `sudo apt-get autoremove`, followed by pressing y to accept the process.



```
david@david-mint ~ $ sudo apt-get autoremove
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages will be REMOVED
  libboost-python1.58.0 python-pyexiv2 variety-slideshow
0 to upgrade, 0 to newly install, 3 to remove and 0 not to upgrade.
After this operation, 1,160 kB disk space will be freed.
Do you want to continue? [Y/n] █
```

**STEP 4** Finally, to tidy up all the non-used packages in the system, and to remove elements that the autoremove command didn't, you can enter: `sudo apt-get autoclean`. These last few steps are vital for keeping your Linux Mint setup in good working order and to trim off the unnecessary excess caused by installations and upgrades.



```
david@david-mint ~ $ sudo apt-get autoclean
Reading package lists... Done
Building dependency tree
Reading state information... Done
david@david-mint ~ $ █
```

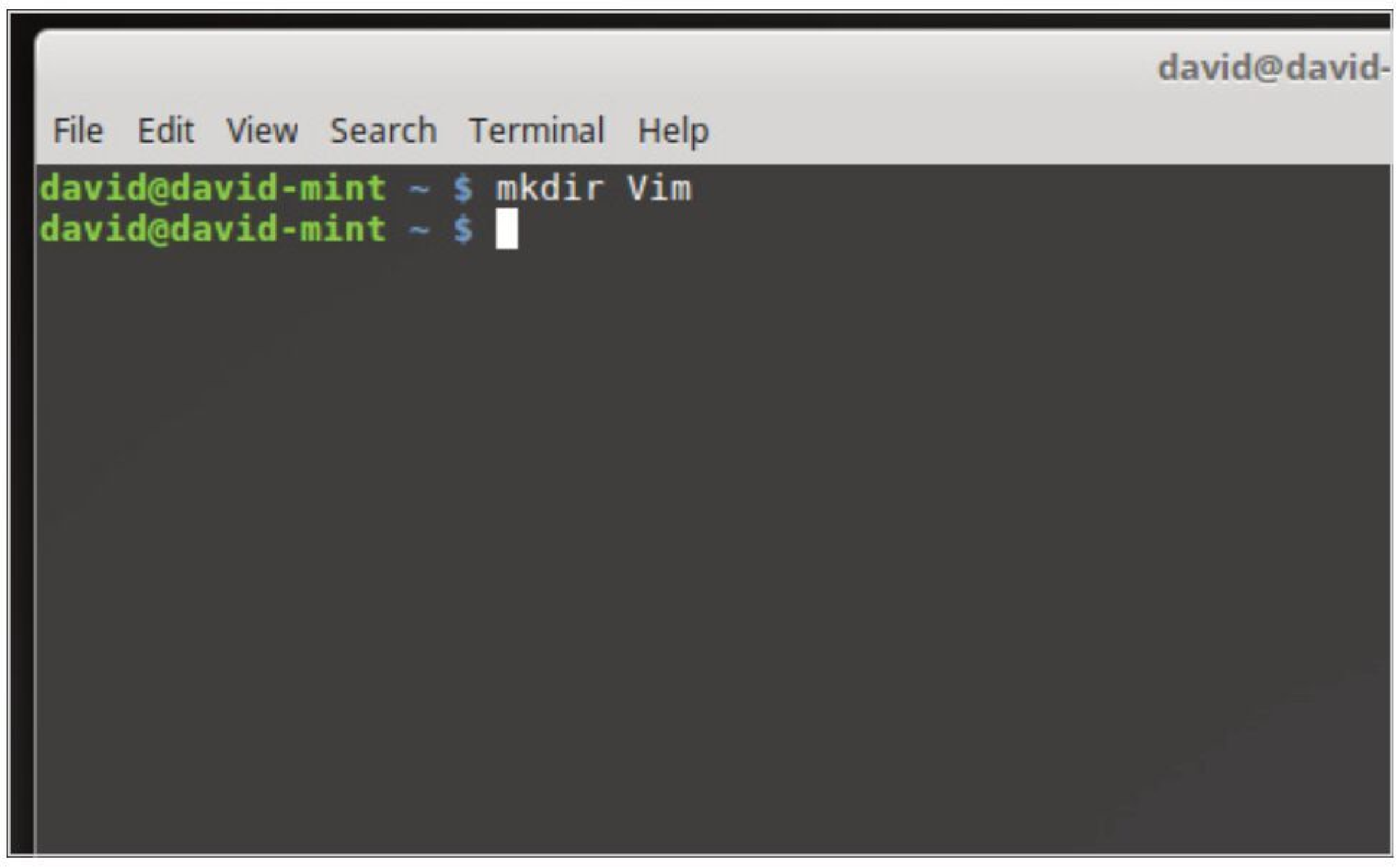
# Install Apps via the Terminal – Part 2

Most of the time you'll get to install apps from the Terminal using the standard apt-get command. However, sometimes an app demands a little more work. This means installing an app from its source code, which isn't as scary as it first sounds.

## FROM THE SOURCE

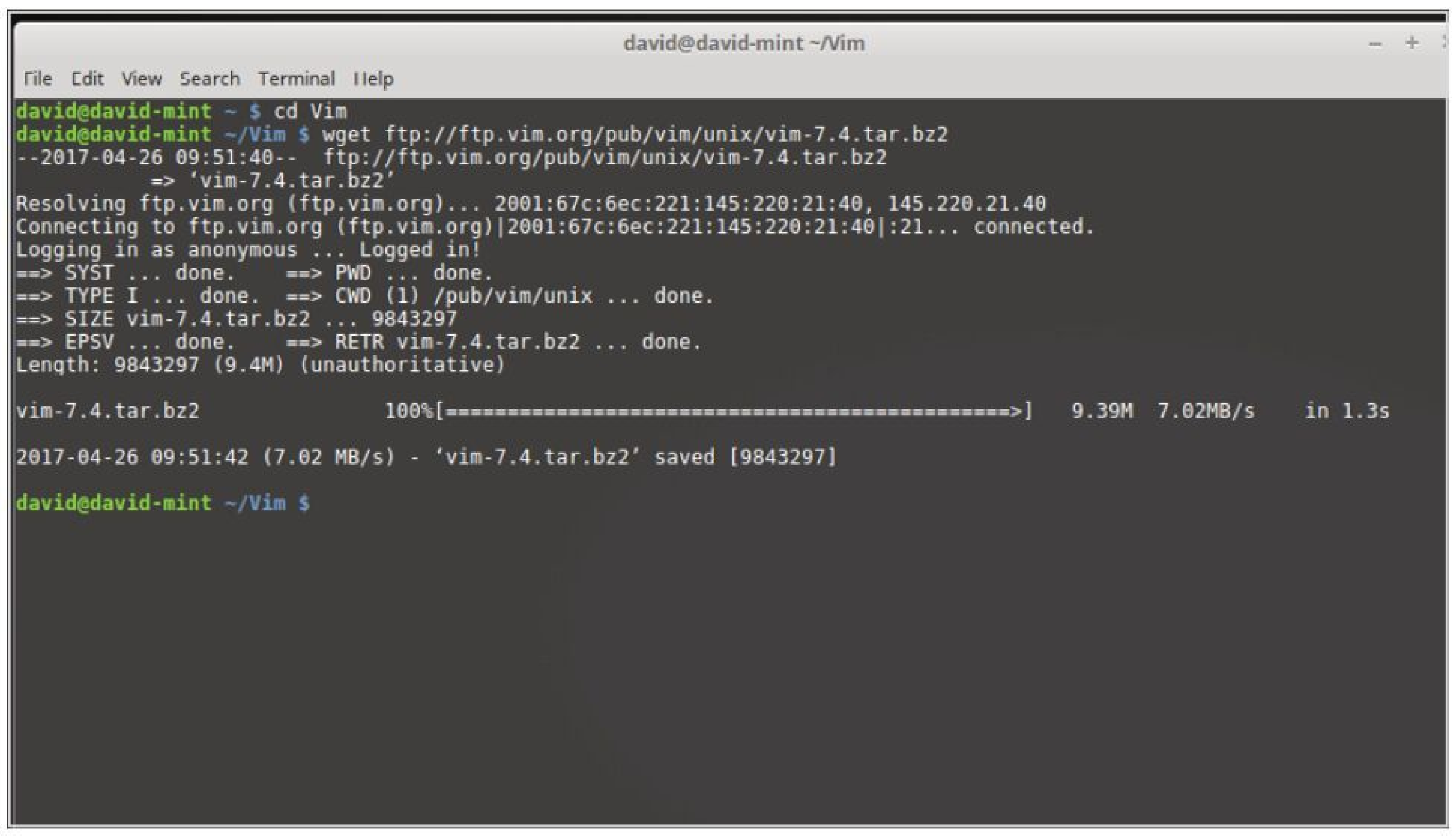
**The commands you'll need to become familiar with here are Configure, Make and Install. You'll find a lot of apps use installing from source, so it's certainly a skill worth investing time in.**

**STEP 1** Source code files for Linux usually come in the form of .TAR.GZ or .TAR.BZ2. Both are compressed files holding all the core files needed to 'make' the app. Start off this tutorial by creating a new folder in Home: `mkdir Vim`.



```
david@david-mint ~ $ mkdir Vim
david@david-mint ~ $ █
```

**STEP 2** Vim, by the way, is an advanced text editor which we'll use as an example to install. Enter the new folder, cd Vim, then from within the new Vim folder, enter the following command into the Terminal: `wget ftp://ftp.vim.org/pub/vim/unix/vim-7.4.tar.bz2`.



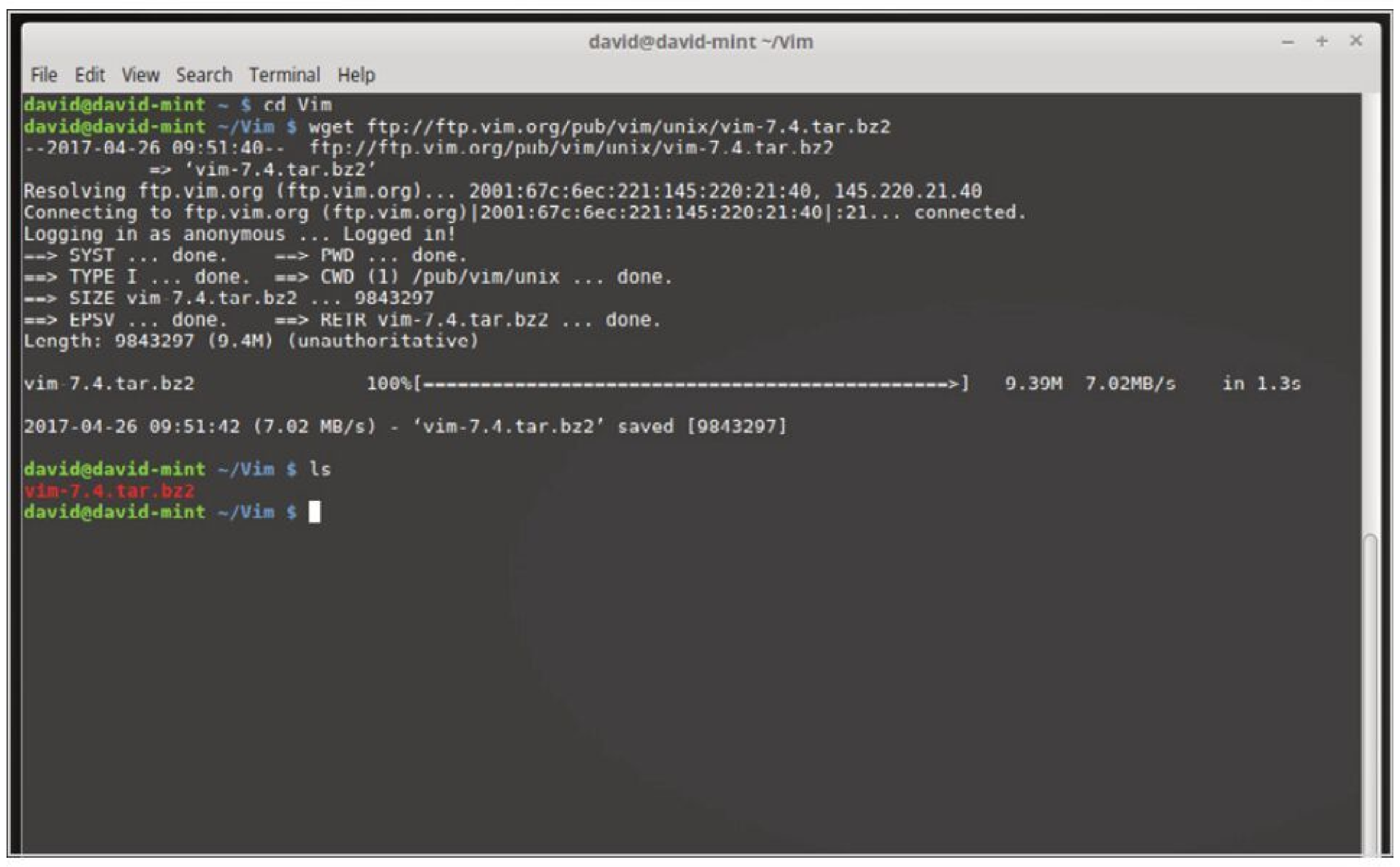
```
david@david-mint ~ $ cd Vim
david@david-mint ~/Vim $ wget ftp://ftp.vim.org/pub/vim/unix/vim-7.4.tar.bz2
--2017-04-26 09:51:40--  ftp://ftp.vim.org/pub/vim/unix/vim-7.4.tar.bz2
           => 'vim-7.4.tar.bz2'
Resolving ftp.vim.org (ftp.vim.org)... 2001:67c:6ec:221:145:220:21:40, 145.220.21.40
Connecting to ftp.vim.org (ftp.vim.org)|2001:67c:6ec:221:145:220:21:40|:21... connected.
Logging in as anonymous ... Logged in!
==> SYST ... done.    ==> PWD ... done.
==> TYPE I ... done.  ==> CWD (1) /pub/vim/unix ... done.
==> SIZE vim-7.4.tar.bz2 ... 9843297
==> EPSV ... done.    ==> RETR vim-7.4.tar.bz2 ... done.
Length: 9843297 (9.4M) (unauthoritative)

vim-7.4.tar.bz2            100%[================================================>]   9.39M  7.02MB/s    in 1.3s

2017-04-26 09:51:42 (7.02 MB/s) - 'vim-7.4.tar.bz2' saved [9843297]

david@david-mint ~/Vim $
```

**STEP 3** The `wget` command retrieves content from the internet, in this case the .BZ2 file for Vim. To check the file was downloaded successfully, enter: ls. According to Mint's file system colour key, the compressed file should be displayed in red.



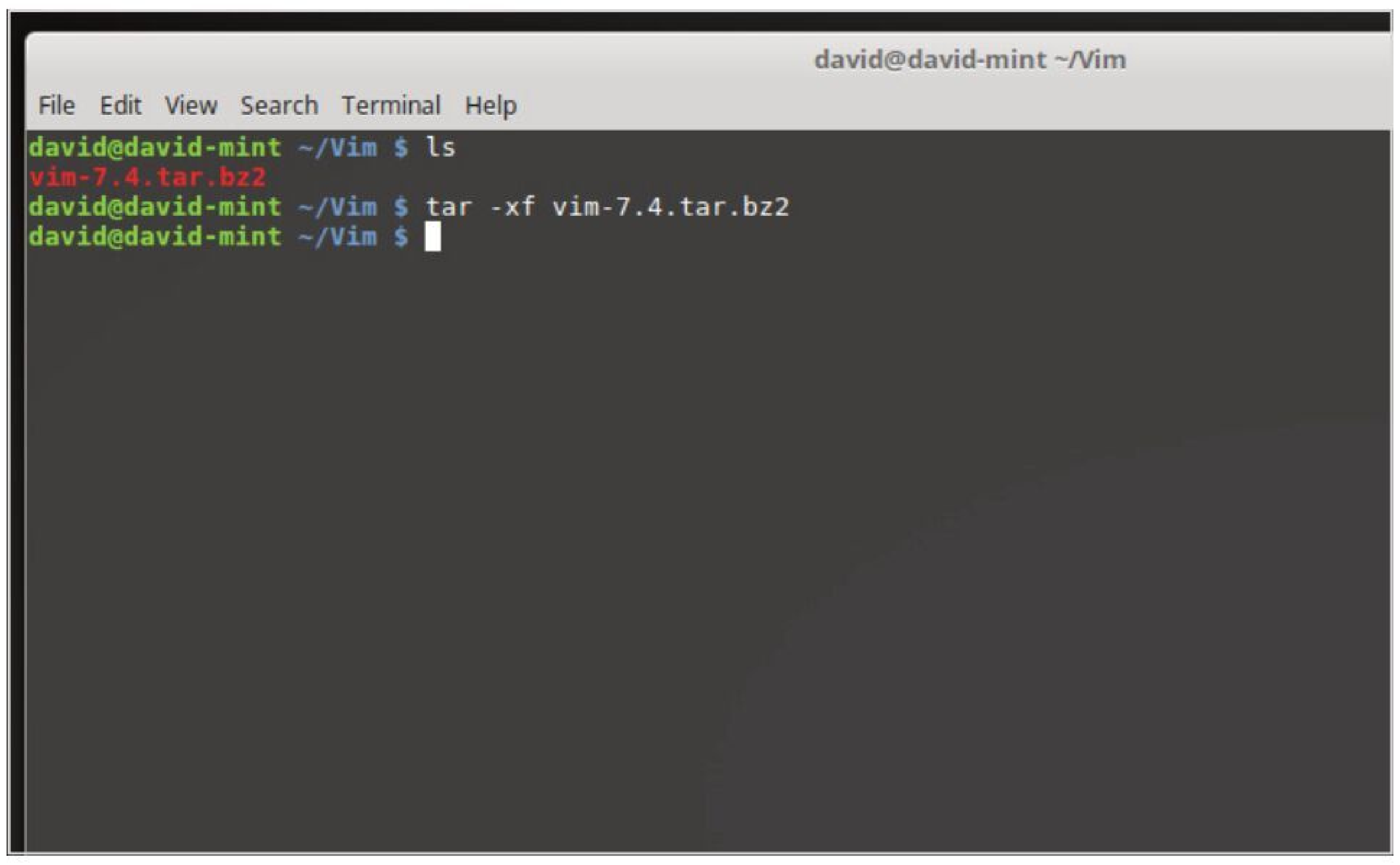
```
david@david-mint ~ $ cd Vim
david@david-mint ~/Vim $ wget ftp://ftp.vim.org/pub/vim/unix/vim-7.4.tar.bz2
--2017-04-26 09:51:40--  ftp://ftp.vim.org/pub/vim/unix/vim-7.4.tar.bz2
           => 'vim-7.4.tar.bz2'
Resolving ftp.vim.org (ftp.vim.org)... 2001:67c:6ec:221:145:220:21:40, 145.220.21.40
Connecting to ftp.vim.org (ftp.vim.org)|2001:67c:6ec:221:145:220:21:40|:21... connected.
Logging in as anonymous ... Logged in!
==> SYST ... done.    ==> PWD ... done.
==> TYPE I ... done.  ==> CWD (1) /pub/vim/unix ... done.
==> SIZE vim-7.4.tar.bz2 ... 9843297
==> EPSV ... done.    ==> RETR vim-7.4.tar.bz2 ... done.
Length: 9843297 (9.4M) (unauthoritative)

vim-7.4.tar.bz2            100%[================================================>]   9.39M  7.02MB/s    in 1.3s

2017-04-26 09:51:42 (7.02 MB/s) - 'vim-7.4.tar.bz2' saved [9843297]

david@david-mint ~/Vim $ ls
vim-7.4.tar.bz2
david@david-mint ~/Vim $ █
```

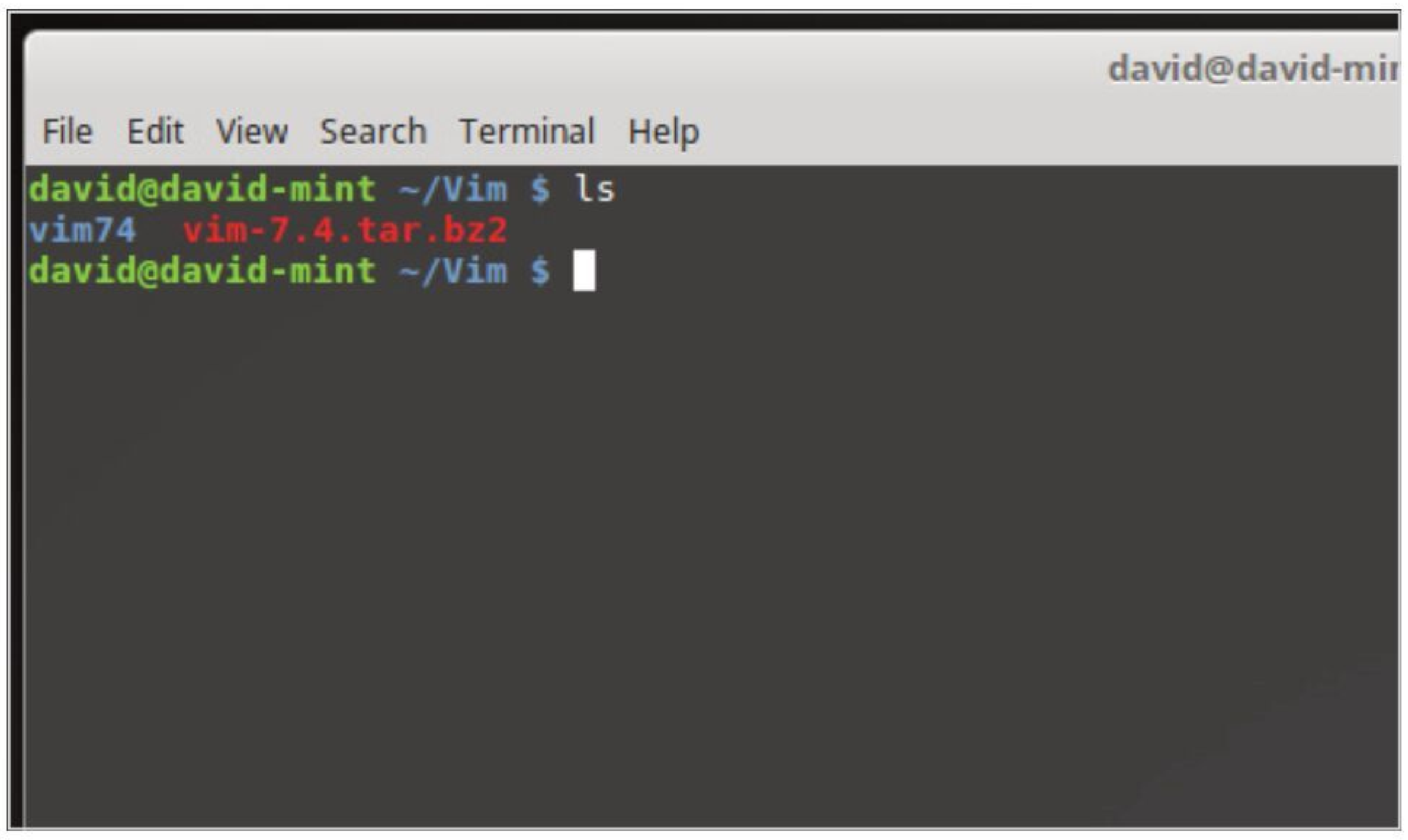
**STEP 4** We need to uncompress the contents of the file now, so enter: `tar -xf vim-7.4.tar.bz2` into the Terminal. Note: you can type in `tar -xf v` and press the `Tab` key to auto-fill the remaining file name.



```
david@david-mint ~/Vim $ ls
vim-7.4.tar.bz2
david@david-mint ~/Vim $ tar -xf vim-7.4.tar.bz2
david@david-mint ~/Vim $ █
```

## STEP 5

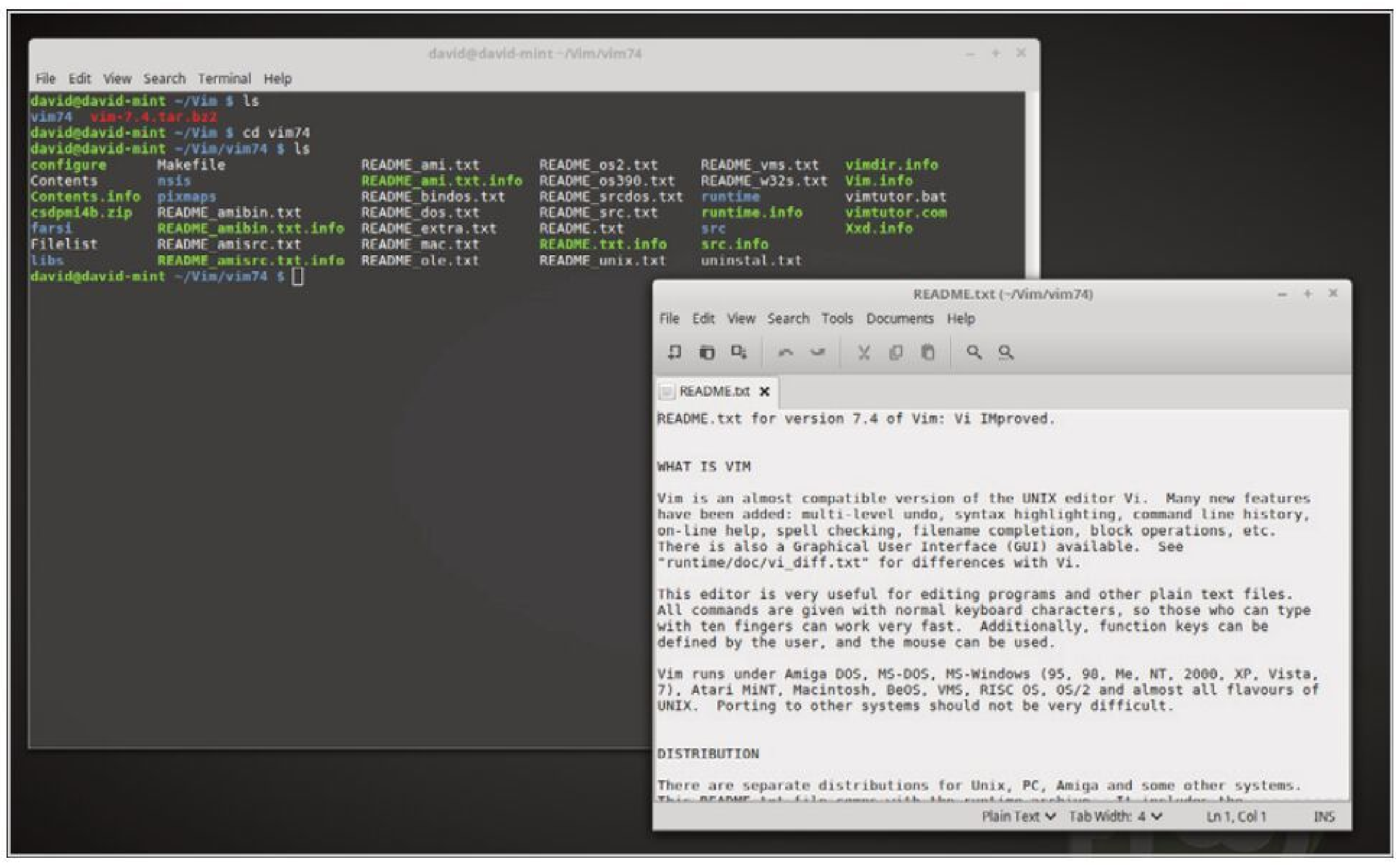
If you enter `ls` again, you'll notice that a new folder has been created: `vim74`; in light blue text representing a folder in Mint. It's always handy to create root folders for the main app, then as you upgrade apps through this method the individual versions will each have their own folder.



```
david@david-mint ~/Vim $ ls
vim74  vim-7.4.tar.bz2
david@david-mint ~/Vim $ 
```

## STEP 6

Type in `cd vim74` to enter the folder, and `ls` again to view its contents. There will likely be a fair number of files present; most are the app's core files, while others will be labelled **README** or **INSTALL**. It's always wise to read these files first as they provide valuable information regarding the installation.


david@david-mint ~/Vim/vim74
File Edit View Search Terminal Help
README.txt (~/Vim/vim74)
File Edit View Search Tools Documents Help
README.txt
Plain Text
Tab Width: 4
Ln 1, Col 1
INS

```
david@david-mint ~/Vim $ ls
vim74  vim-7.4.tar.bz2
david@david-mint ~/Vim $ cd vim74
david@david-mint ~/Vim/vim74 $ ls
configure      Makefile                README_ami.txt        README_os2.txt      README_vms.txt   vimdir.info
Contents       nsis                    README_ami.txt.info   README_os390.txt    README_w32s.txt  Vim.info
Contents.info  pixmaps                 README_bindos.txt     README_srcdos.txt   runtime          vimtutor.bat
csdpmi4b.zip   README_amibin.txt       README_dos.txt        README_src.txt      runtime.info     vimtutor.com
farsi          README_amibin.txt.info  README_extra.txt      README.txt          src              Xxd.info
Filelist       README_amisrc.txt       README_mac.txt        README.txt.info     src.info
libs           README_amisrc.txt.info  README_ole.txt        README_unix.txt     uninstal.txt
david@david-mint ~/Vim/vim74 $ 
```

```
README.txt for version 7.4 of Vim: Vi IMproved.


WHAT IS VIM

Vim is an almost compatible version of the UNIX editor Vi.  Many new features
have been added: multi-level undo, syntax highlighting, command line history,
on-line help, spell checking, filename completion, block operations, etc.
There is also a Graphical User Interface (GUI) available.  See
"runtime/doc/vi_diff.txt" for differences with Vi.

This editor is very useful for editing programs and other plain text files.
All commands are given with normal keyboard characters, so those who can type
with ten fingers can work very fast.  Additionally, function keys can be
defined by the user, and the mouse can be used.

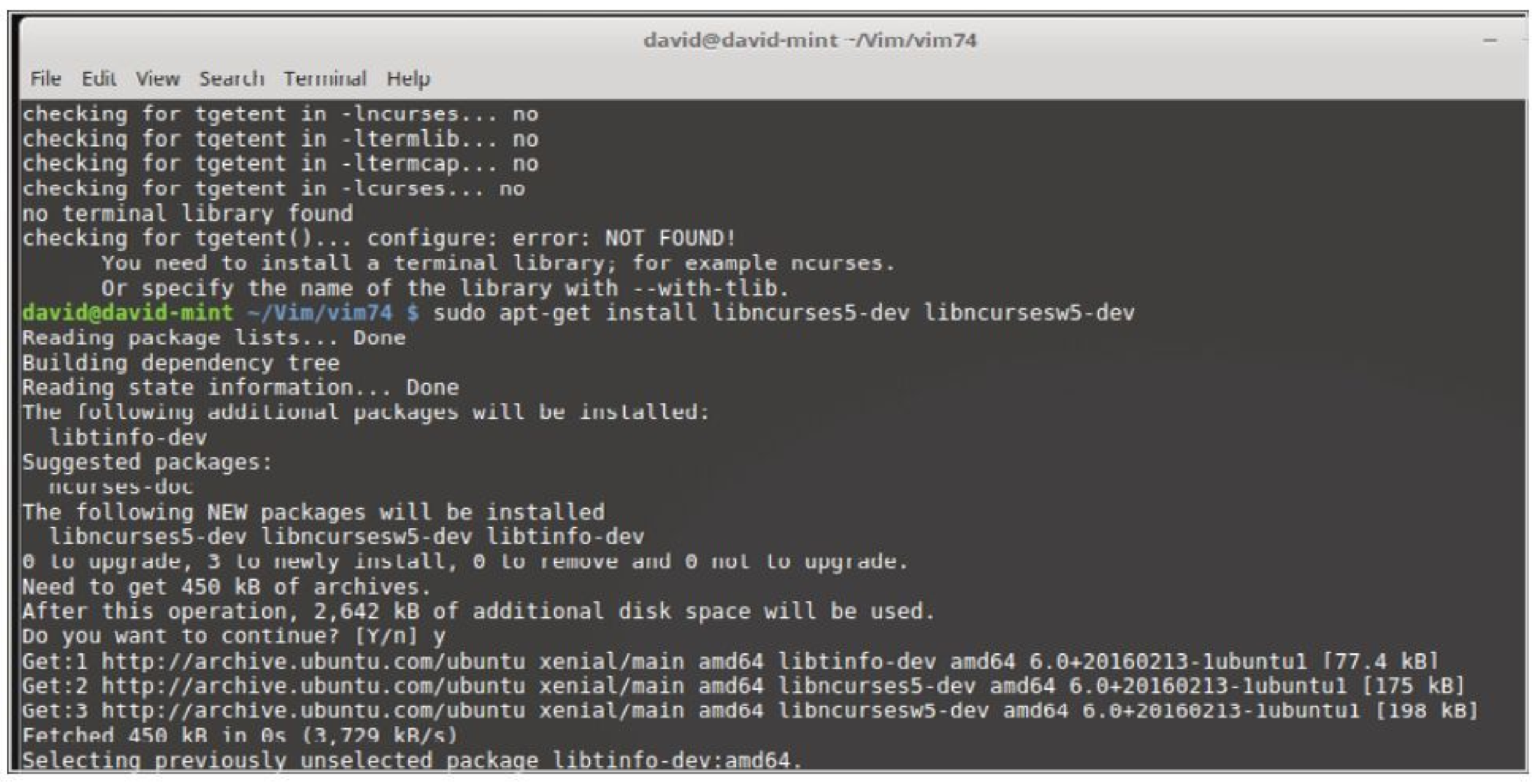
Vim runs under Amiga DOS, MS-DOS, MS-Windows (95, 98, Me, NT, 2000, XP, Vista,
7), Atari MiNT, Macintosh, BeOS, VMS, RISC OS, OS/2 and almost all flavours of
UNIX.  Porting to other systems should not be very difficult.


DISTRIBUTION

There are separate distributions for Unix, PC, Amiga and some other systems.
```

## STEP 7

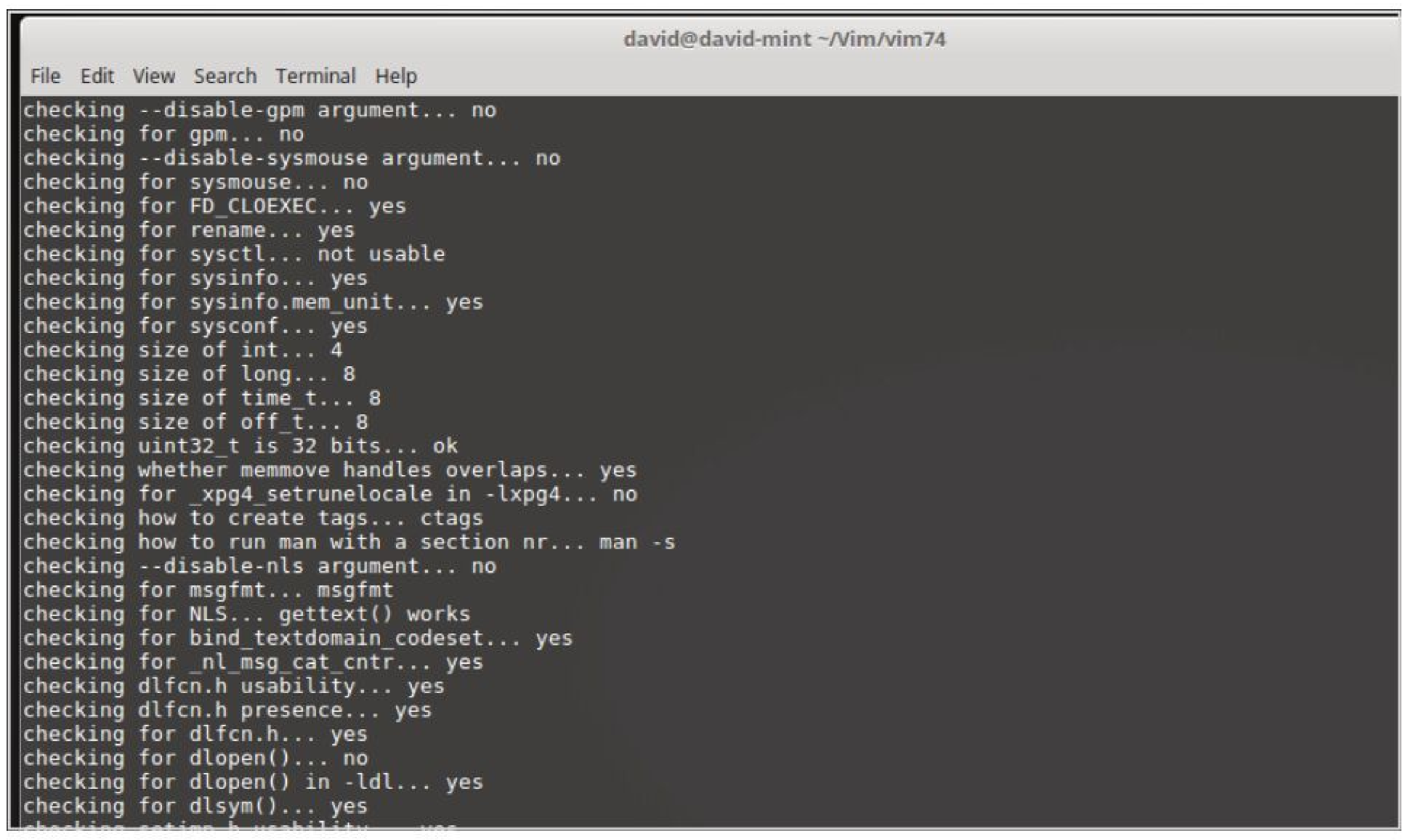
The first part of the installation requires you to enter `./configure`. The ./configure command will check your system for any missing dependencies associated with the app. If you received an error regarding a C Compiler, then enter: `sudo apt-get install build-essential`. The third-party app Ncurses was recorded as missing. We need to install that with: `sudo apt-get install libncurses5-dev libncursesw5-dev`.


david@david-mint ~/Vim/vim74
File Edit View Search Terminal Help

```
checking for tgetent in -lncurses... no
checking for tgetent in -ltermlib... no
checking for tgetent in -ltermcap... no
checking for tgetent in -lcurses... no
no terminal library found
checking for tgetent()... configure: error: NOT FOUND!
      You need to install a terminal library; for example ncurses.
      Or specify the name of the library with --with-tlib.
david@david-mint ~/Vim/vim74 $ sudo apt-get install libncurses5-dev libncursesw5-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libtinfo-dev
Suggested packages:
  ncurses-doc
The following NEW packages will be installed
  libncurses5-dev libncursesw5-dev libtinfo-dev
0 to upgrade, 3 to newly install, 0 to remove and 0 not to upgrade.
Need to get 450 kB of archives.
After this operation, 2,642 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://archive.ubuntu.com/ubuntu xenial/main amd64 libtinfo-dev amd64 6.0+20160213-1ubuntu1 [77.4 kB]
Get:2 http://archive.ubuntu.com/ubuntu xenial/main amd64 libncurses5-dev amd64 6.0+20160213-1ubuntu1 [175 kB]
Get:3 http://archive.ubuntu.com/ubuntu xenial/main amd64 libncursesw5-dev amd64 6.0+20160213-1ubuntu1 [198 kB]
Fetched 450 kB in 0s (3,729 kB/s)
Selecting previously unselected package libtinfo-dev:amd64.
```

## STEP 8

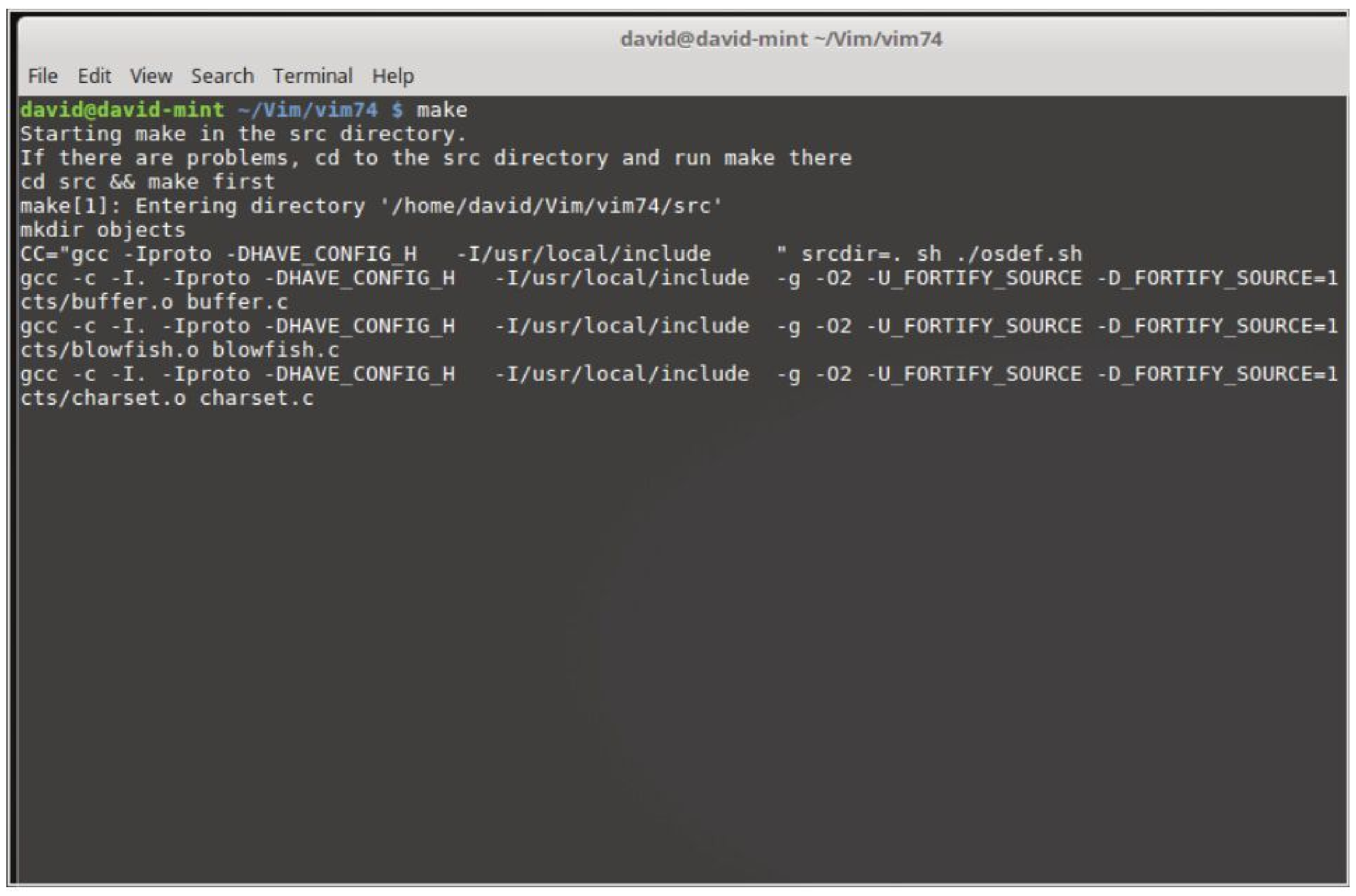
You may need to keep installing new dependencies, depending on the app. After each new dependency is installed, re-run `./configure` and when it doesn't report back with an error you can continue to the next stage of the installation. Note: you may need to search online for some error messages.


david@david-mint ~/Vim/vim74
File Edit View Search Terminal Help

```
checking --disable-gpm argument... no
checking for gpm... no
checking --disable-sysmouse argument... no
checking for sysmouse... no
checking for FD_CLOEXEC... yes
checking for rename... yes
checking for sysctl... not usable
checking for sysinfo... yes
checking for sysinfo.mem_unit... yes
checking for sysconf... yes
checking size of int... 4
checking size of long... 8
checking size of time_t... 8
checking size of off_t... 8
checking uint32_t is 32 bits... ok
checking whether memmove handles overlaps... yes
checking for _xpg4_setrunelocale in -lxpg4... no
checking how to create tags... ctags
checking how to run man with a section nr... man -s
checking --disable-nls argument... no
checking for msgfmt... msgfmt
checking for NLS... gettext() works
checking for bind_textdomain_codeset... yes
checking for _nl_msg_cat_cntr... yes
checking dlfcn.h usability... yes
checking dlfcn.h presence... yes
checking for dlfcn.h... yes
checking for dlopen()... no
checking for dlopen() in -ldl... yes
checking for dlsym()... yes
```

## STEP 9

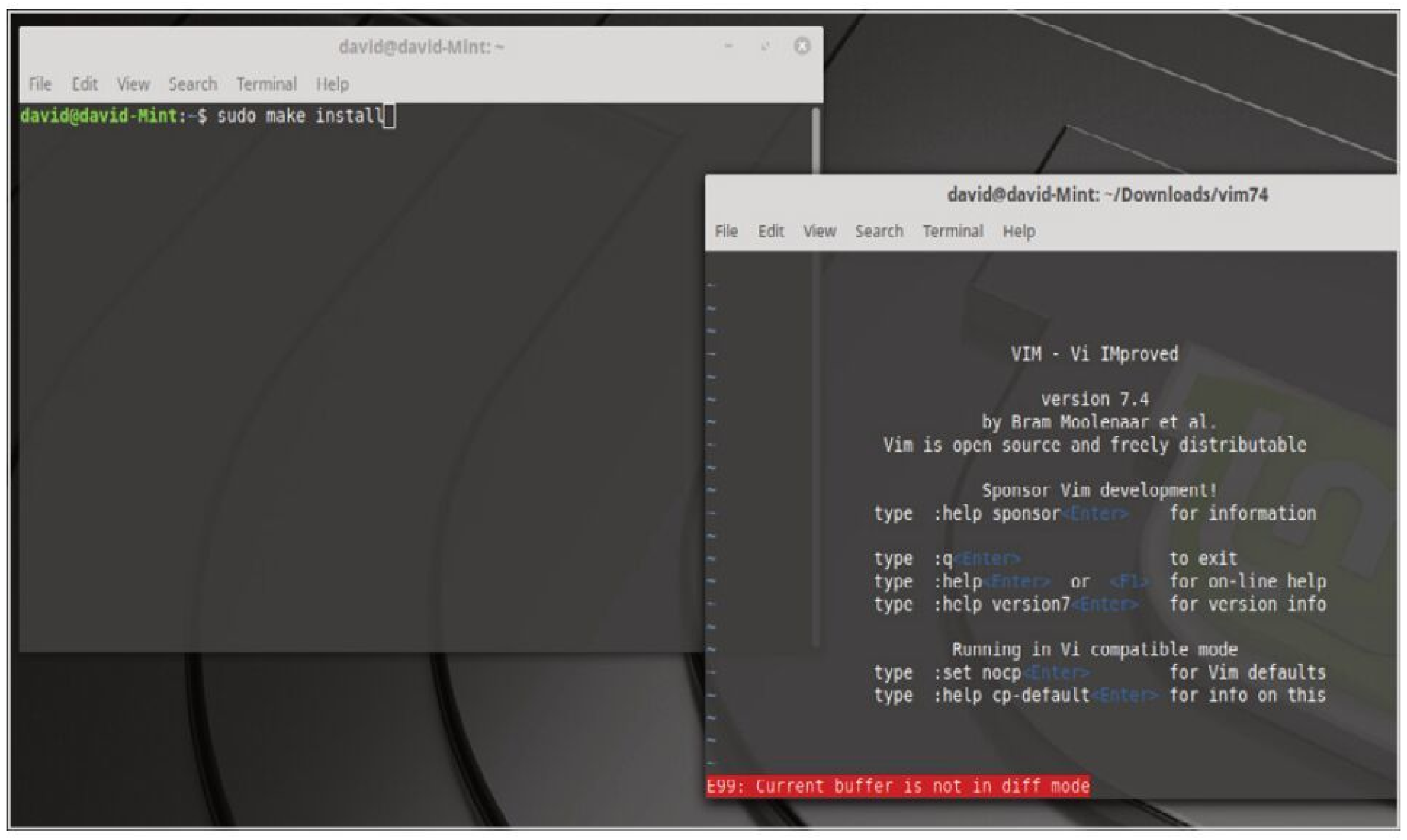
With a successful `./configure`, the system will create a **Makefile**. This needs to be 'made' by entering: `make` into the Terminal. This may take a while, depending on the size of the app.


david@david-mint ~/Vim/vim74
File Edit View Search Terminal Help

```
david@david-mint ~/Vim/vim74 $ make
Starting make in the src directory.
If there are problems, cd to the src directory and run make there
cd src && make first
make[1]: Entering directory '/home/david/Vim/vim74/src'
mkdir objects
CC="gcc -Iproto -DHAVE_CONFIG_H   -I/usr/local/include     " srcdir=. sh ./osdef.sh
gcc -c -I. -Iproto -DHAVE_CONFIG_H   -I/usr/local/include  -g -O2 -U_FORTIFY_SOURCE -D_FORTIFY_SOURCE=1
cts/buffer.o buffer.c
gcc -c -I. -Iproto -DHAVE_CONFIG_H   -I/usr/local/include  -g -O2 -U_FORTIFY_SOURCE -D_FORTIFY_SOURCE=1
cts/blowfish.o blowfish.c
gcc -c -I. -Iproto -DHAVE_CONFIG_H   -I/usr/local/include  -g -O2 -U_FORTIFY_SOURCE -D_FORTIFY_SOURCE=1
cts/charset.o charset.c
```

## STEP 10

Finally, you need to enter: `sudo make install` into the Terminal. This will install the app, and make it ready for use in the system. When complete you can execute the app, in this case by entering vim into the Terminal or searching for it via the Dash.


david@david-Mint: ~
File Edit View Search Terminal Help
david@david-Mint: ~/Downloads/vim74
File Edit View Search Terminal Help

```
david@david-Mint:~$ sudo make install
```

```
                 VIM - Vi IMproved

                  version 7.4
             by Bram Moolenaar et al.
   Vim is open source and freely distributable

            Sponsor Vim development!
type  :help sponsor<Enter>    for information

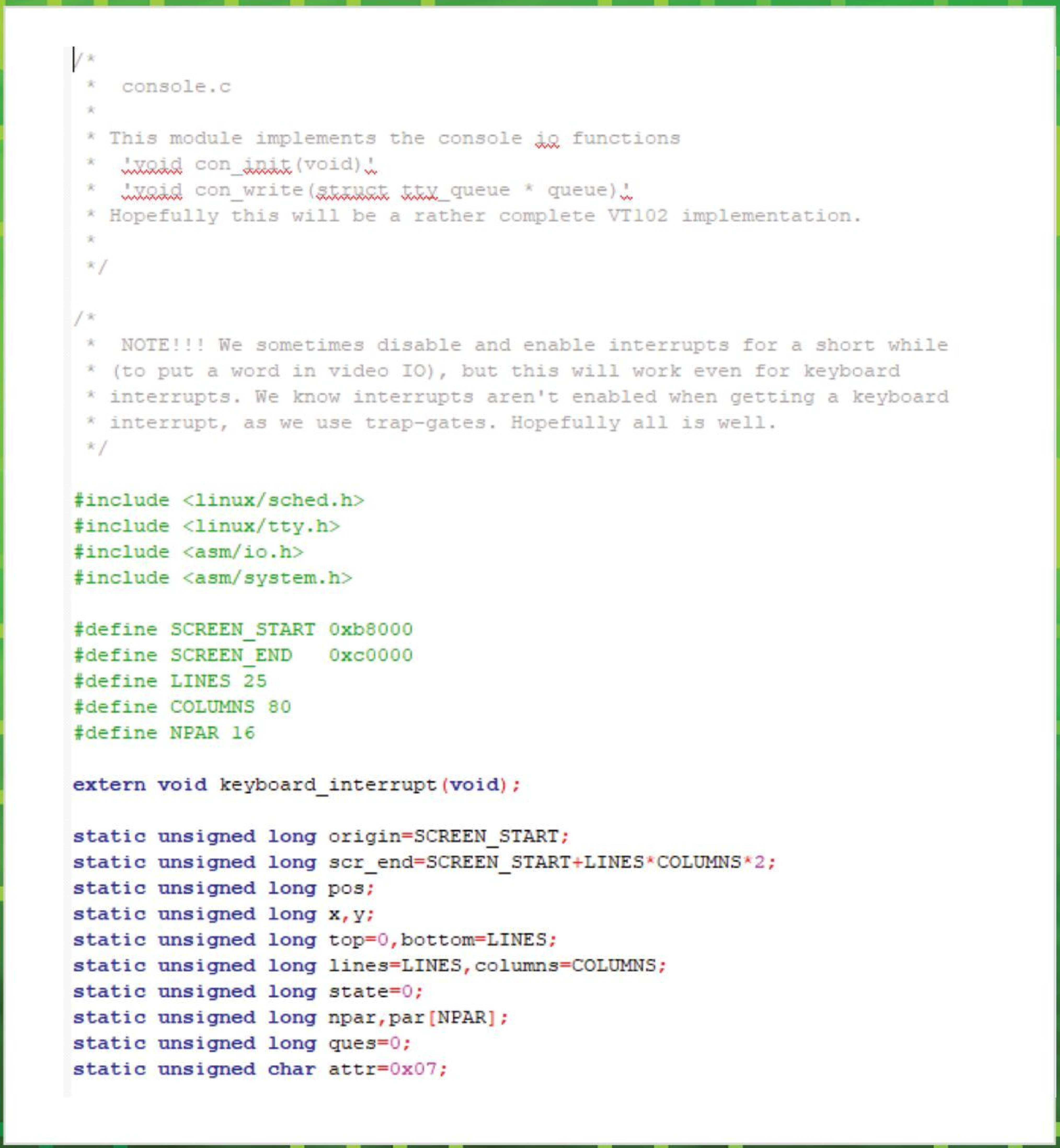
type  :q<Enter>               to exit
type  :help<Enter>  or  <F1>  for on-line help
type  :help version7<Enter>   for version info

           Running in Vi compatible mode
type  :set nocp<Enter>        for Vim defaults
type  :help cp-default<Enter> for info on this

E99: Current buffer is not in diff mode
```

```
Kernel command line: block2mtd.block2mtd=/dev/hda2,131072,rootfs root=/dev/mtdbl
ock0 rootfstype=jffs2 init=/etc/preinit  noinitrd console=tty0 console=ttyS0,384
00n8 reboot=bios
Found and enabled local APIC!
Enabling fast FPU save and restore... done.
Enabling unmasked SIMD FPU exception support... done.
Initializing CPU#0
PID hash table entries: 32 (order: 5, 128 bytes)
Detected 1991.657 MHz processor.
Console: colour VGA+ 80x25
console [tty0] enabled
console [ttyS0] enabled
Dentry cache hash table entries: 1024 (order: 0, 4096 bytes)
Inode-cache hash table entries: 1024 (order: 0, 4096 bytes)
Memory: 5112k/8128k available (1497k kernel code, 2624k reserved, 597k data, 196
k init, 0k highmem)
virtual kernel memory layout:
    fixmap  : 0xfffb9000 - 0xfffff000   ( 280 kB)
    vmalloc : 0xc1000000 - 0xfffb7000   (1007 MB)
    lowmem  : 0xc0000000 - 0xc07f0000   (   7 MB)
      .init : 0xc0313000 - 0xc0344000   ( 196 kB)
      .data : 0xc027653c - 0xc030bcfc   ( 597 kB)
      .text : 0xc0100000 - 0xc027653c   (1497 kB)
Checking if this processor honours the WP bit even in supervisor mode...Ok.
Calibrating delay using timer specific routine.. 4047.64 BogoMIPS (lpj=20238210)
```

# Linux Kernel **0.01**



```
/*
 *  console.c
 *
 * This module implements the console io functions
 *  'void con_init(void)'
 *  'void con_write(struct tty_queue * queue)'
 * Hopefully this will be a rather complete VT102 implementation.
 *
 */

/*
 *  NOTE!!! We sometimes disable and enable interrupts for a short while
 * (to put a word in video IO), but this will work even for keyboard
 * interrupts. We know interrupts aren't enabled when getting a keyboard
 * interrupt, as we use trap-gates. Hopefully all is well.
 */

#include <linux/sched.h>
#include <linux/tty.h>
#include <asm/io.h>
#include <asm/system.h>

#define SCREEN_START 0xb8000
#define SCREEN_END   0xc0000
#define LINES 25
#define COLUMNS 80
#define NPAR 16

extern void keyboard_interrupt(void);

static unsigned long origin=SCREEN_START;
static unsigned long scr_end=SCREEN_START+LINES*COLUMNS*2;
static unsigned long pos;
static unsigned long x,y;
static unsigned long top=0,bottom=LINES;
static unsigned long lines=LINES,columns=COLUMNS;
static unsigned long state=0;
static unsigned long npar,par[NPAR];
static unsigned long ques=0;
static unsigned char attr=0x07;
```

**DID YOU KNOW…** that the first Linux kernel, as programmed by Linus Torvalds, only occupied 65KB of memory? And that since version 0.01, the Linux kernel now boasts over 18 million lines of code. Not bad for a university project that now runs the New York Stock Exchange, and powers the US Department of Defence's fleet of nuclear submarines.

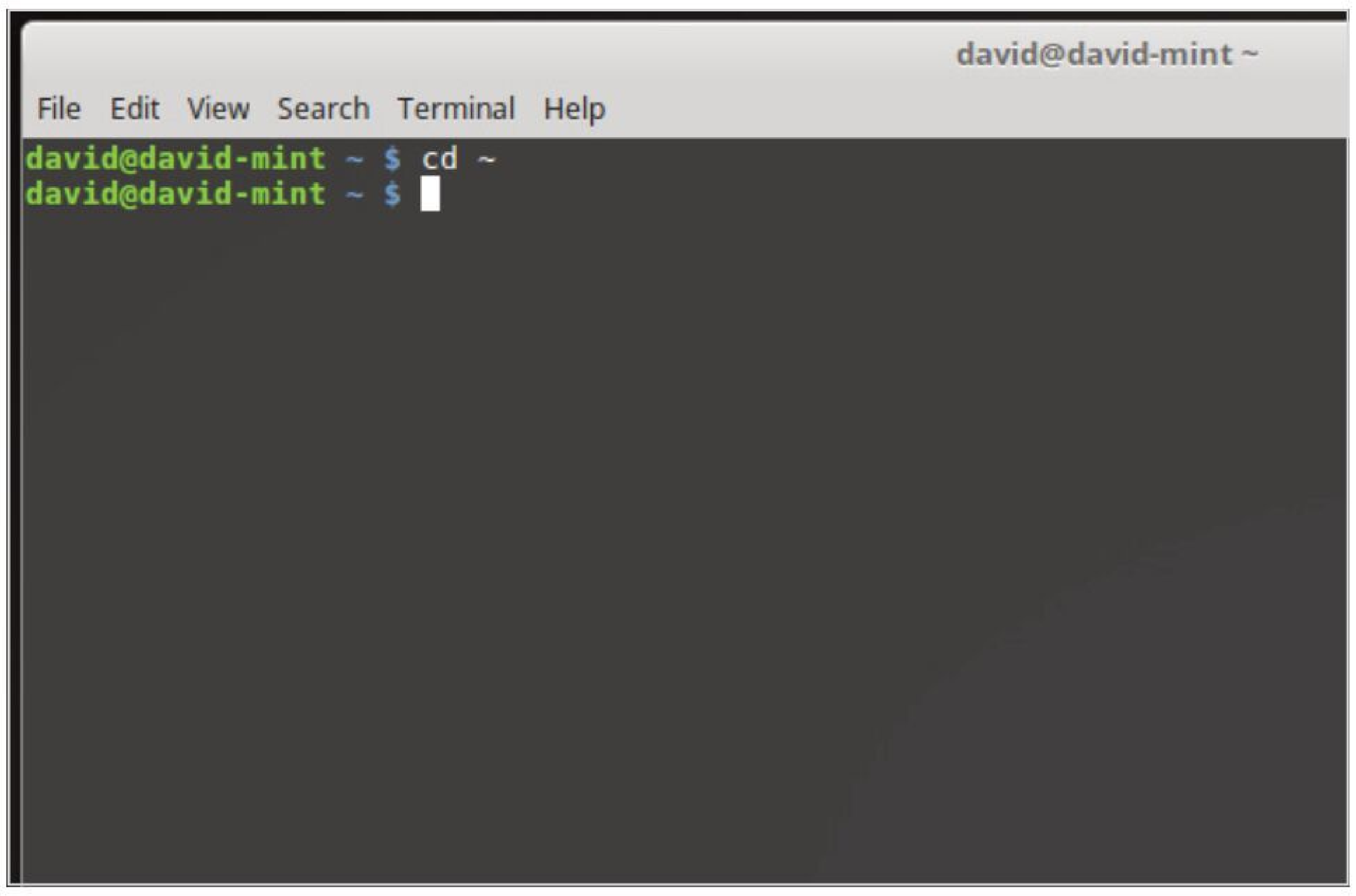
# Creating a File Using the Terminal

**Using the Terminal, you're able to create folders, files and even execute Linux Mint apps. In truth, if you didn't have the GUI at hand, you could still accomplish the same from the Terminal.**

## MORE TERMINAL WORK

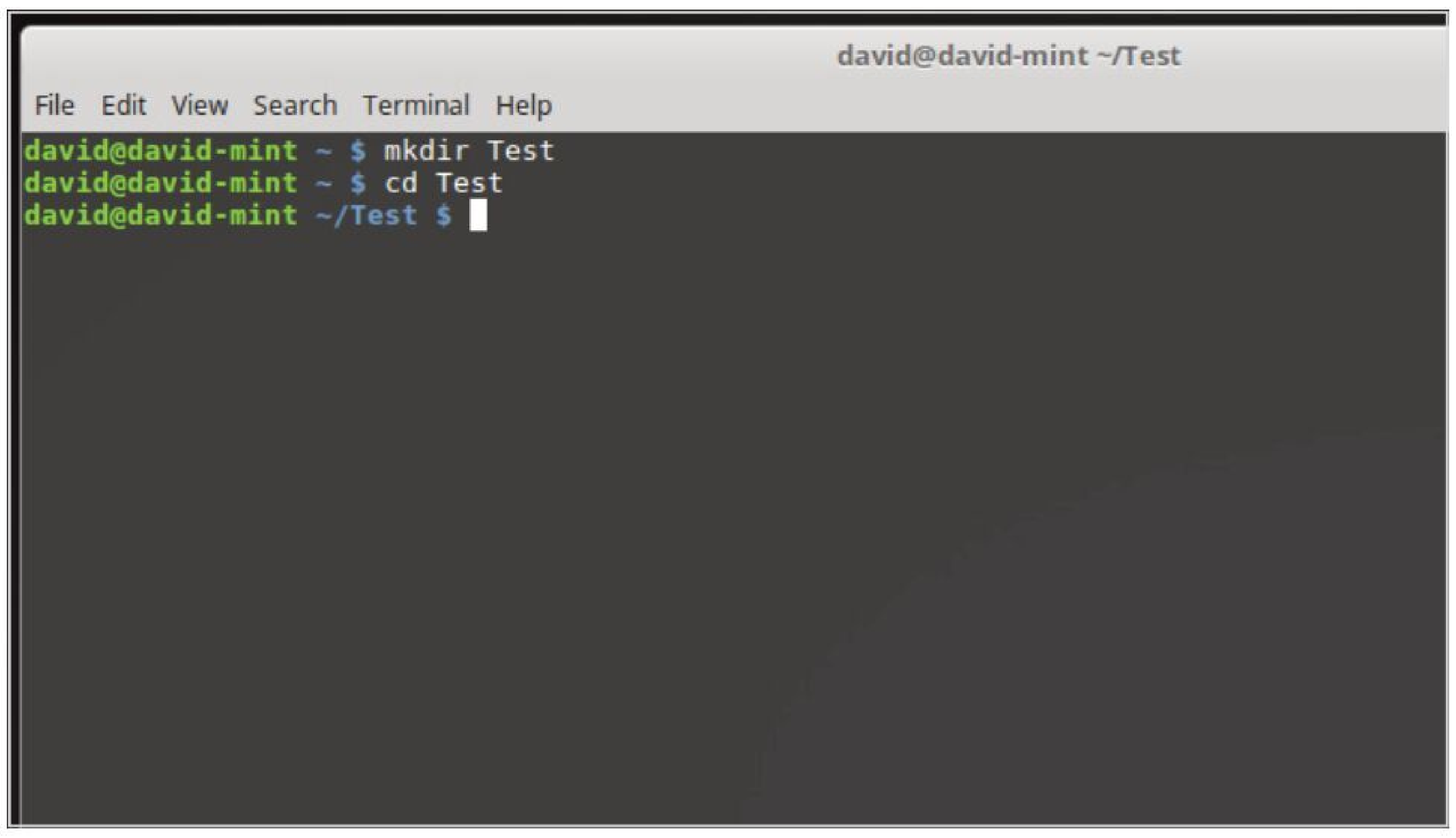
**Creating content using the Terminal isn't quite as strenuous as it may first appear. Yes, the Terminal can look a daunting place for the newcomer, but once mastered it's really quite intuitive.**

**STEP 1** Open up the Terminal, and make sure you're in the Home folder. If not use the **cd ~** command to return you to the Home folder from wherever you're currently located.


david@david-mint ~
File Edit View Search Terminal Help

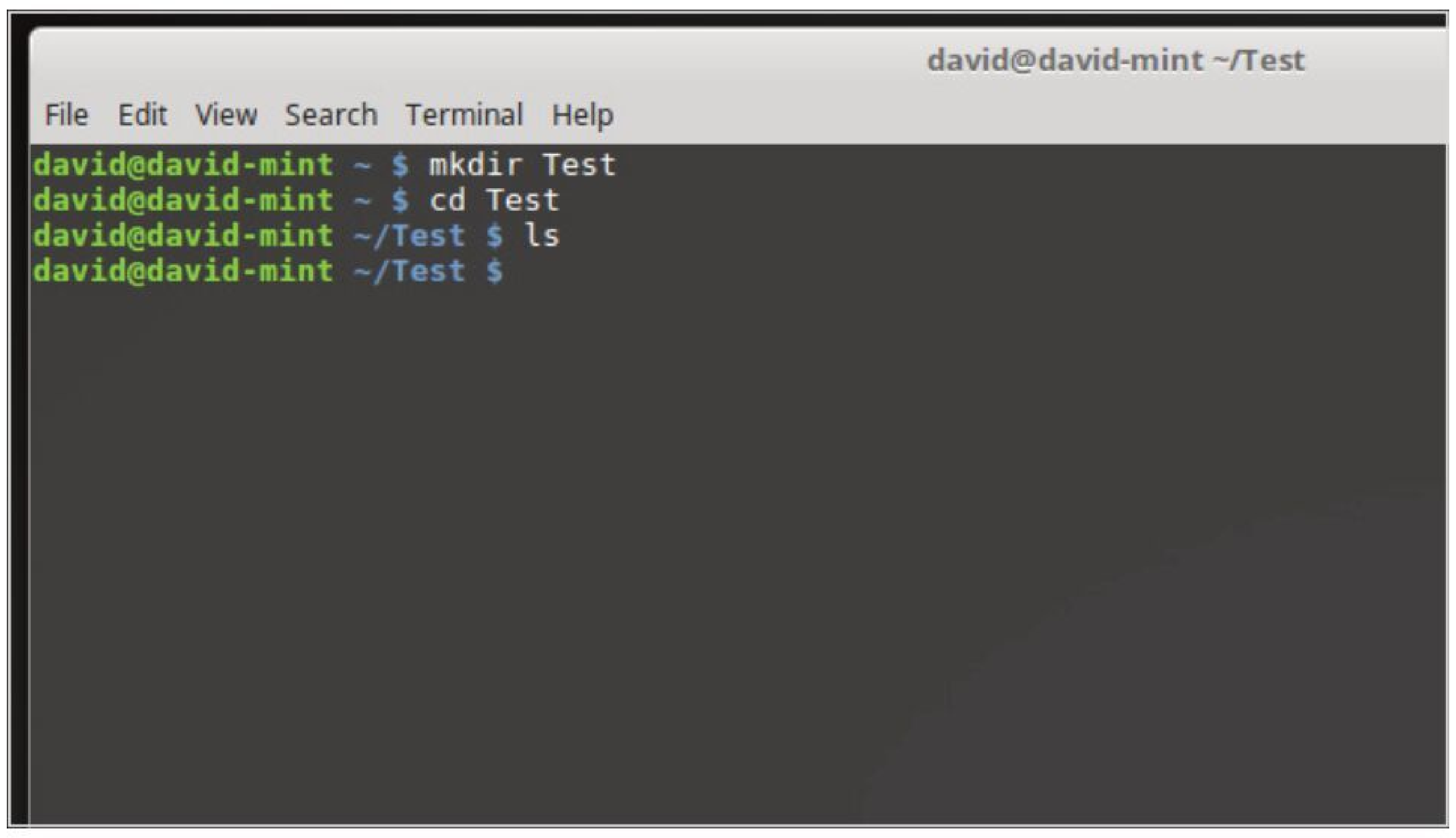
```
david@david-mint ~ $ cd ~
david@david-mint ~ $ 
```

**STEP 2** Let's start by creating a new folder within Home, and call it **Test**. The command you'll need is `mkdir` Test. Press **Enter** to create the folder when you've typed in the command, then `cd Test` and press **Enter**. This will **C**hange **D**irectory (hence **CD**) to the newly created Test folder.


david@david-mint ~/Test
File Edit View Search Terminal Help

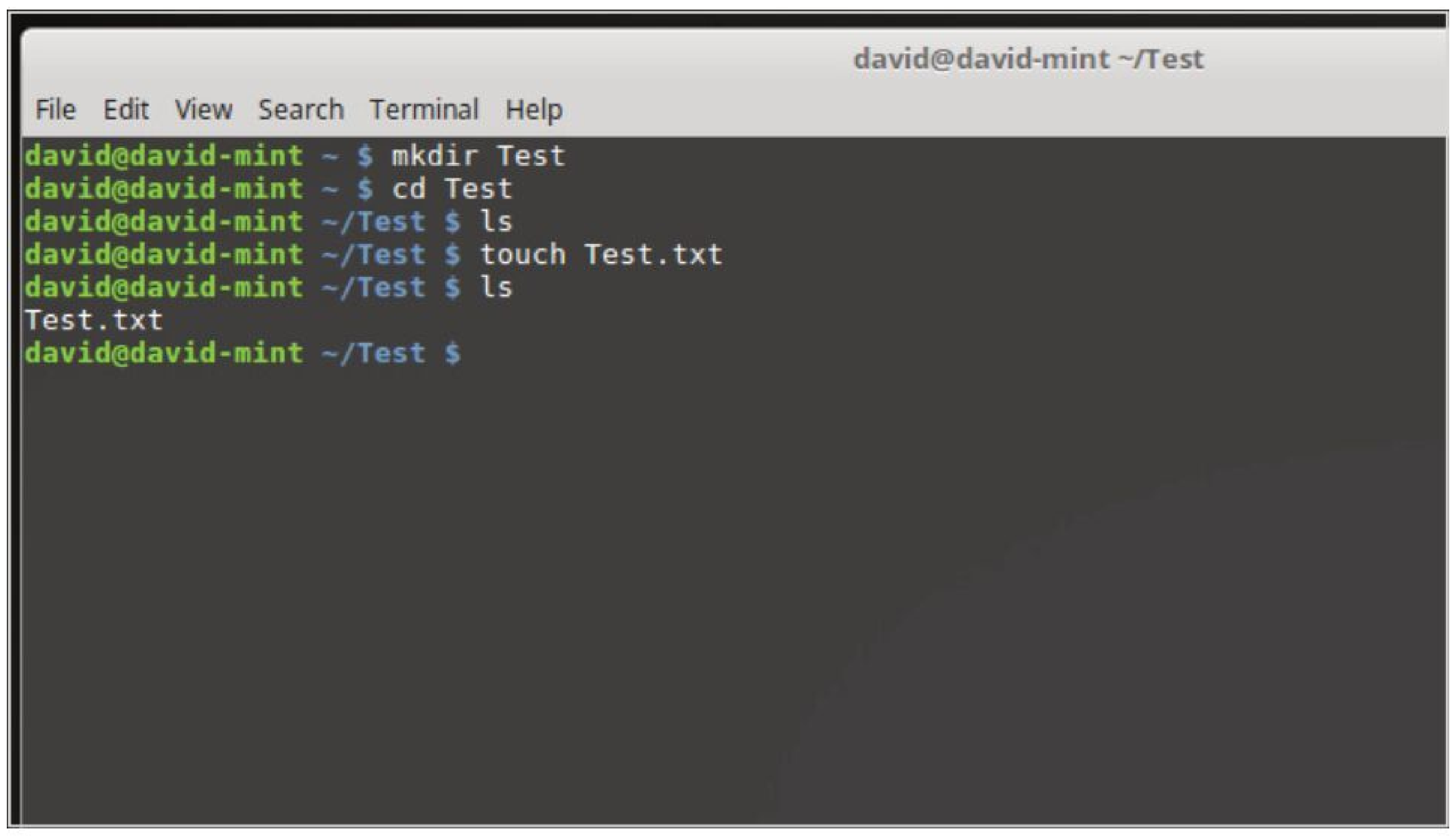
```
david@david-mint ~ $ mkdir Test
david@david-mint ~ $ cd Test
david@david-mint ~/Test $ 
```

**STEP 3** Your command line should change to the Test folder and if you enter `ls` (List folder contents) there'll be nothing within the folder; as you've just created it. The `mkdir` command is fairly self explanatory: Make Directory followed by the name of your choosing.


david@david-mint ~/Test
File Edit View Search Terminal Help

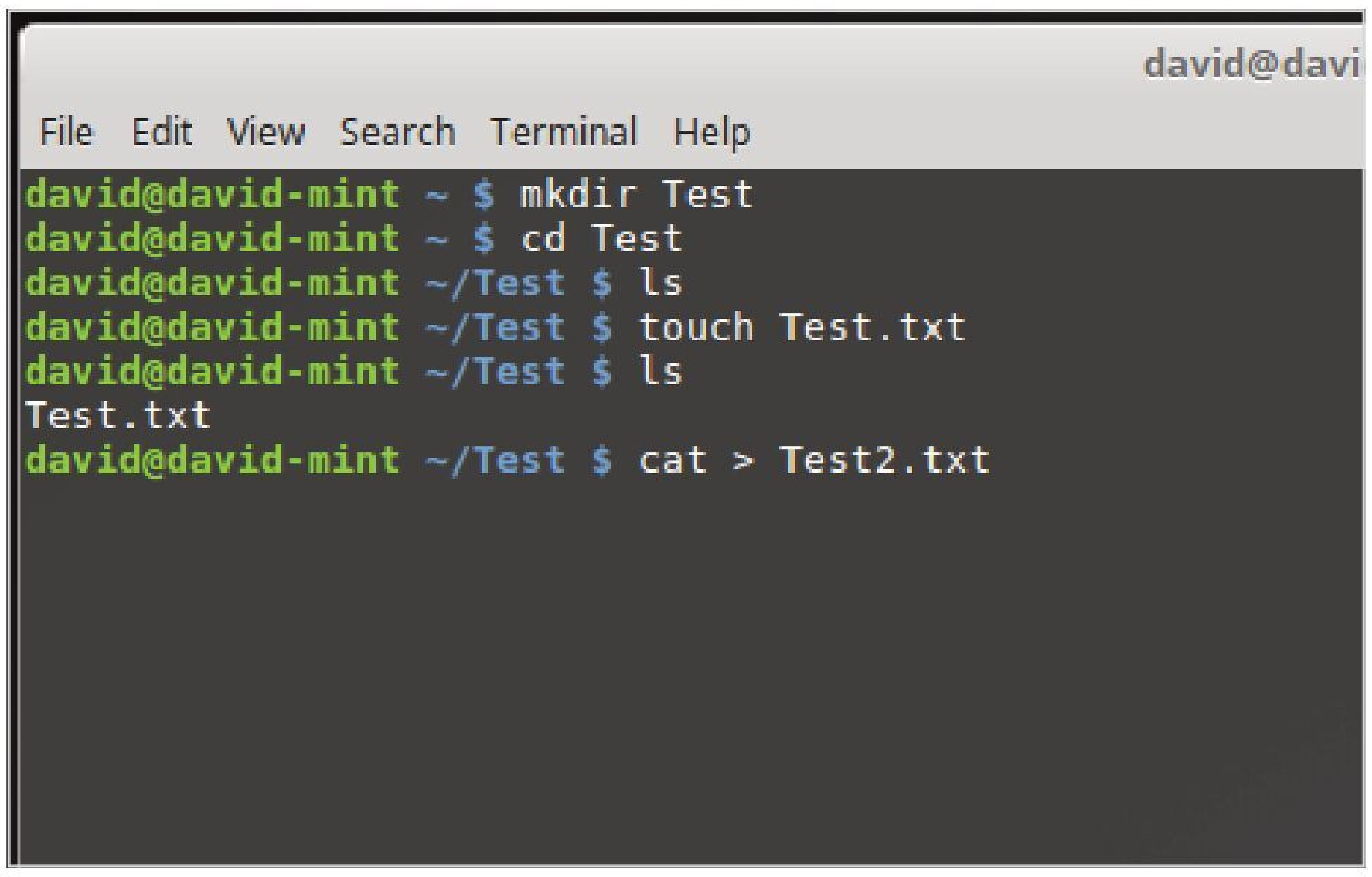
```
david@david-mint ~ $ mkdir Test
david@david-mint ~ $ cd Test
david@david-mint ~/Test $ ls
david@david-mint ~/Test $
```

**STEP 4** To create an empty text file, called **Test.txt**, enter in the Terminal: `touch Test.txt`. You can then use `ls` to view the new file in the folder. Touch is a standard Linux command that allows the creation of files without the need to open a text editor, save the file, then close the editor.


david@david-mint ~/Test
File Edit View Search Terminal Help

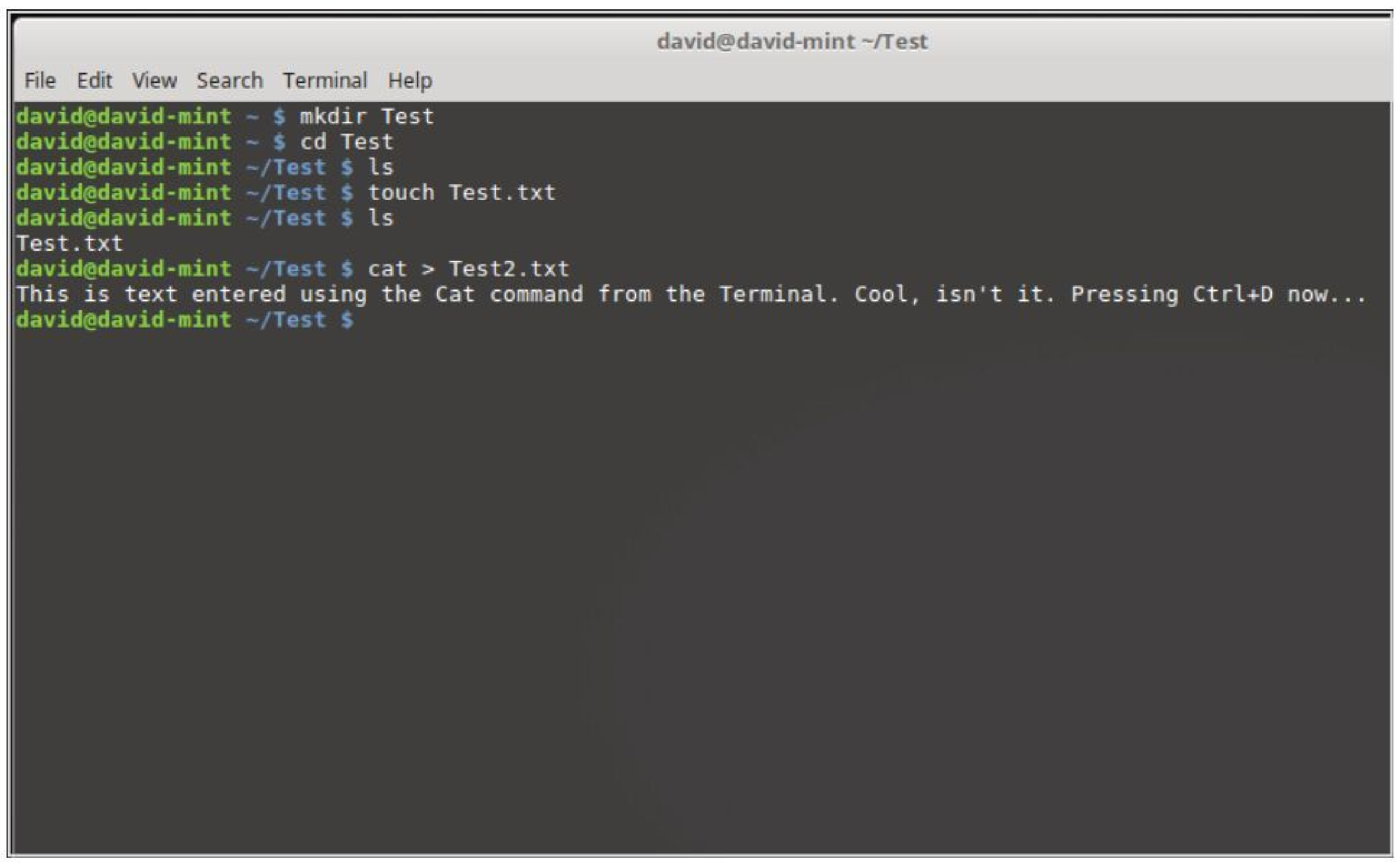
```
david@david-mint ~ $ mkdir Test
david@david-mint ~ $ cd Test
david@david-mint ~/Test $ ls
david@david-mint ~/Test $ touch Test.txt
david@david-mint ~/Test $ ls
Test.txt
david@david-mint ~/Test $
```

**STEP 5** Let's say you now wanted to create a text file, we'll call it Test2.txt, complete with some content. To do so, enter: `cat > Test2.txt`. This will create the file **Test2.txt** and put the Terminal into an editing mode.


david@davi
File Edit View Search Terminal Help

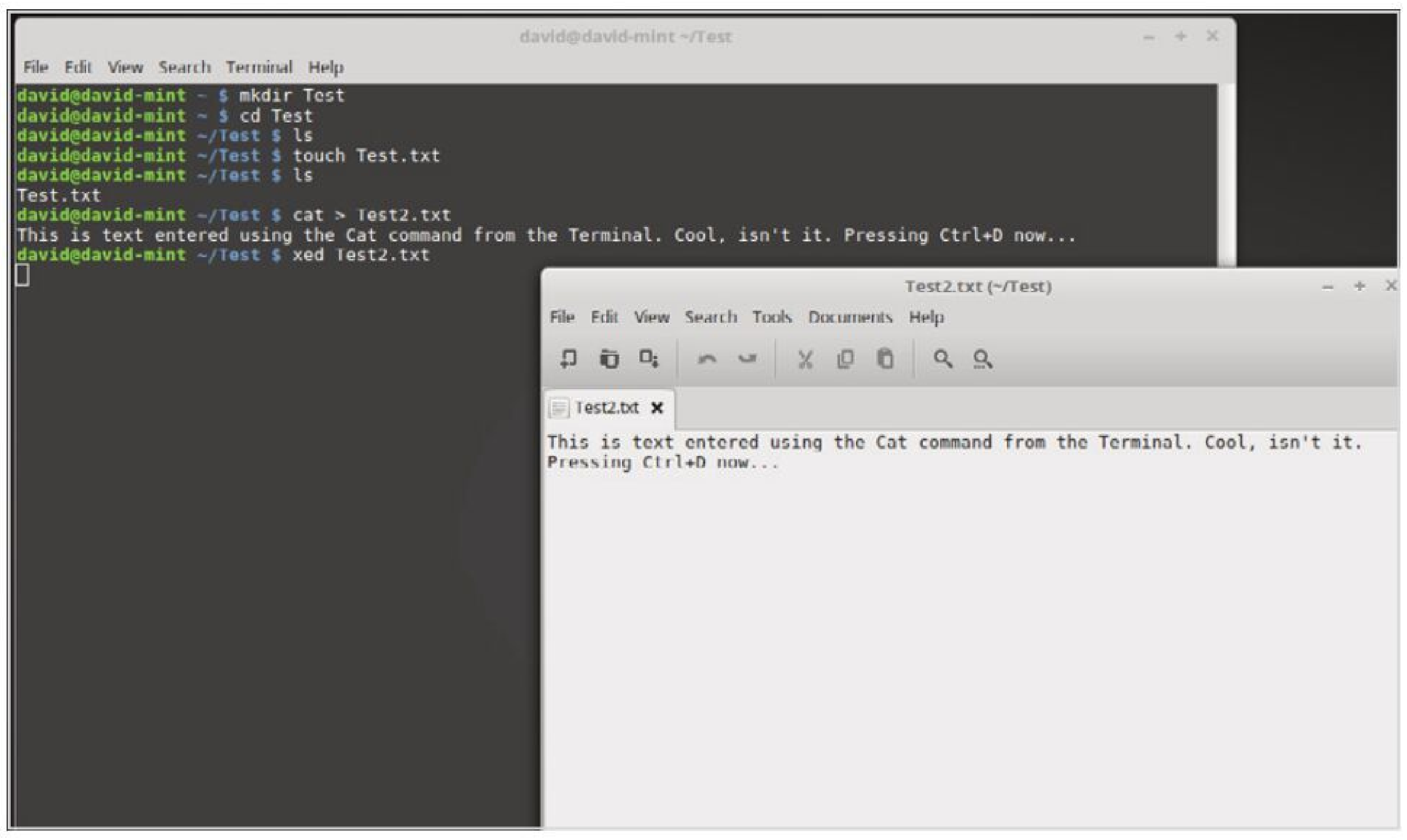
```
david@david-mint ~ $ mkdir Test
david@david-mint ~ $ cd Test
david@david-mint ~/Test $ ls
david@david-mint ~/Test $ touch Test.txt
david@david-mint ~/Test $ ls
Test.txt
david@david-mint ~/Test $ cat > Test2.txt
```

**STEP 6** You'll notice that the cursor is flashing below the `cat > Test2.txt` command, without the usual prompt. This editing mode will allow you enter the text that the file will contain. Enter some text, then press **Ctrl+D** to exit and write the contents to the file.


david@david-mint ~/Test
File Edit View Search Terminal Help

```
david@david-mint ~ $ mkdir Test
david@david-mint ~ $ cd Test
david@david-mint ~/Test $ ls
david@david-mint ~/Test $ touch Test.txt
david@david-mint ~/Test $ ls
Test.txt
david@david-mint ~/Test $ cat > Test2.txt
This is text entered using the Cat command from the Terminal. Cool, isn't it. Pressing Ctrl+D now...
david@david-mint ~/Test $
```

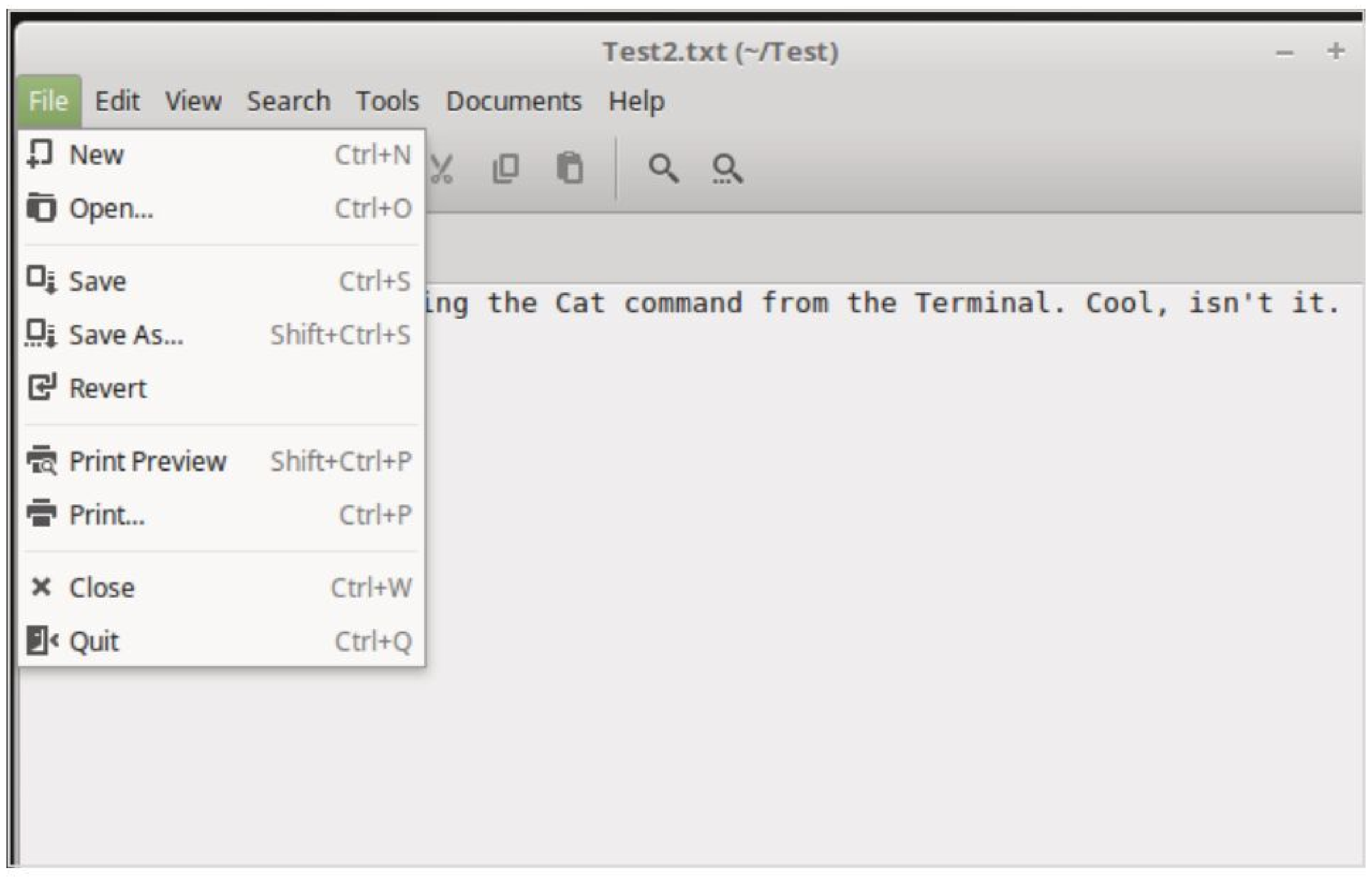
**STEP 7** Of course you don't always have to use the Terminal to enter text into a file. Mint comes with a text editor called **Xed**, which is similar to Windows' Notepad. To view the previously created file in Xed, type into the Terminal: `xed Test2.txt`, and press **Enter**.


david@david-mint ~/Test
File Edit View Search Terminal Help
Test2.txt (~/Test)
File Edit View Search Tools Documents Help
Test2.txt

```
david@david-mint ~ $ mkdir Test
david@david-mint ~ $ cd Test
david@david-mint ~/Test $ ls
david@david-mint ~/Test $ touch Test.txt
david@david-mint ~/Test $ ls
Test.txt
david@david-mint ~/Test $ cat > Test2.txt
This is text entered using the Cat command from the Terminal. Cool, isn't it. Pressing Ctrl+D now...
david@david-mint ~/Test $ xed Test2.txt
```

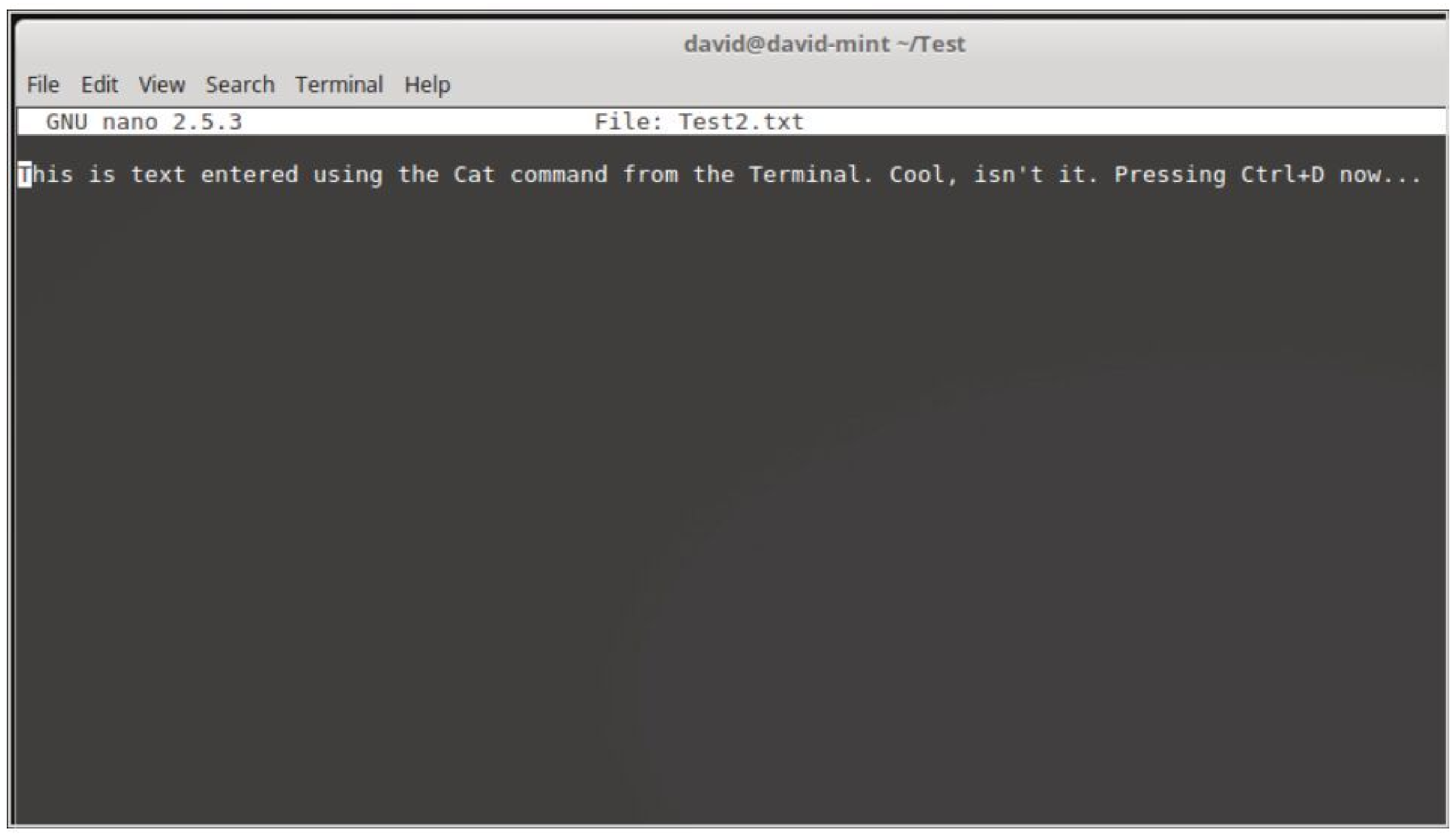
```
This is text entered using the Cat command from the Terminal. Cool, isn't it.
Pressing Ctrl+D now...
```

**STEP 8** Xed is a GUI app, and you can enter text and save the file, or any file, accordingly by using the app's main window, and the **File > Save**, or **File > Save As** functions from its top menu bar options.


Test2.txt (~/Test)
File Edit View Search Tools Documents Help
New Ctrl+N
Open... Ctrl+O
Save Ctrl+S
Save As... Shift+Ctrl+S
Revert
Print Preview Shift+Ctrl+P
Print... Ctrl+P
Close Ctrl+W
Quit Ctrl+Q

```
ing the Cat command from the Terminal. Cool, isn't it.
```

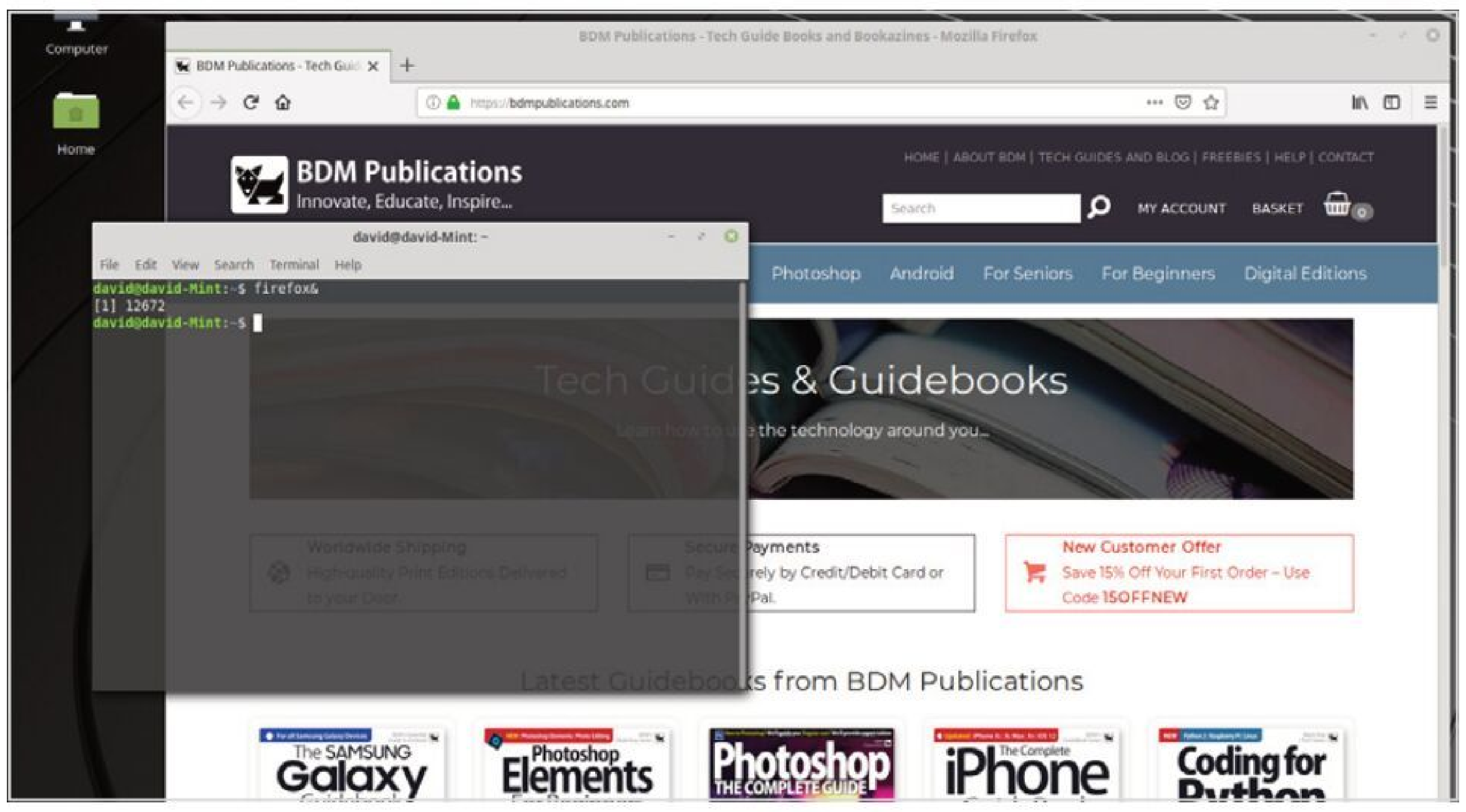
**STEP 9** If, however, you prefer to remain working in the Terminal to edit/save/create files, you can use **Nano**. Nano is a simple Terminal-based text editor. To try it with the example, enter: `nano Test2.txt`. There's a menu along the bottom of the screen. To exit and save any content in Nano, press **Ctrl+X** and follow the on-screen instructions.


david@david-mint ~/Test
File Edit View Search Terminal Help

```
  GNU nano 2.5.3                    File: Test2.txt

This is text entered using the Cat command from the Terminal. Cool, isn't it. Pressing Ctrl+D now...
```

**STEP 10** We've used the Terminal to launch a Mint app, Xed, but any app can be launched from within the Terminal. For example, try: **firefox**, and press **Enter**. Close Firefox to return to the Terminal. Providing you know the name of the app, it can run from the Terminal. Additionally, entering `firefox&` opens Firefox, AND lets you still use the Terminal.


Computer
Home
BDM Publications - Tech Guide Books and Bookazines - Mozilla Firefox
BDM Publications - Tech Gui
https://bdmpublications.com
BDM Publications
Innovate, Educate, Inspire...
HOME | ABOUT BDM | TECH GUIDES AND BLOG | FREEBIES | HELP | CONTACT
MY ACCOUNT
BASKET
Photoshop
Android
For Seniors
For Beginners
Digital Editions
Tech Guides & Guidebooks
New Customer Offer
Save 15% Off Your First Order – Use Code 15OFFNEW
Latest Guidebooks from BDM Publications
The SAMSUNG Galaxy
Photoshop Elements
Photoshop THE COMPLETE GUIDE
The Complete iPhone
Coding for Python
david@david-Mint: ~
File Edit View Search Terminal Help

```
david@david-Mint:~$ firefox&
[1] 12672
david@david-Mint:~$
```

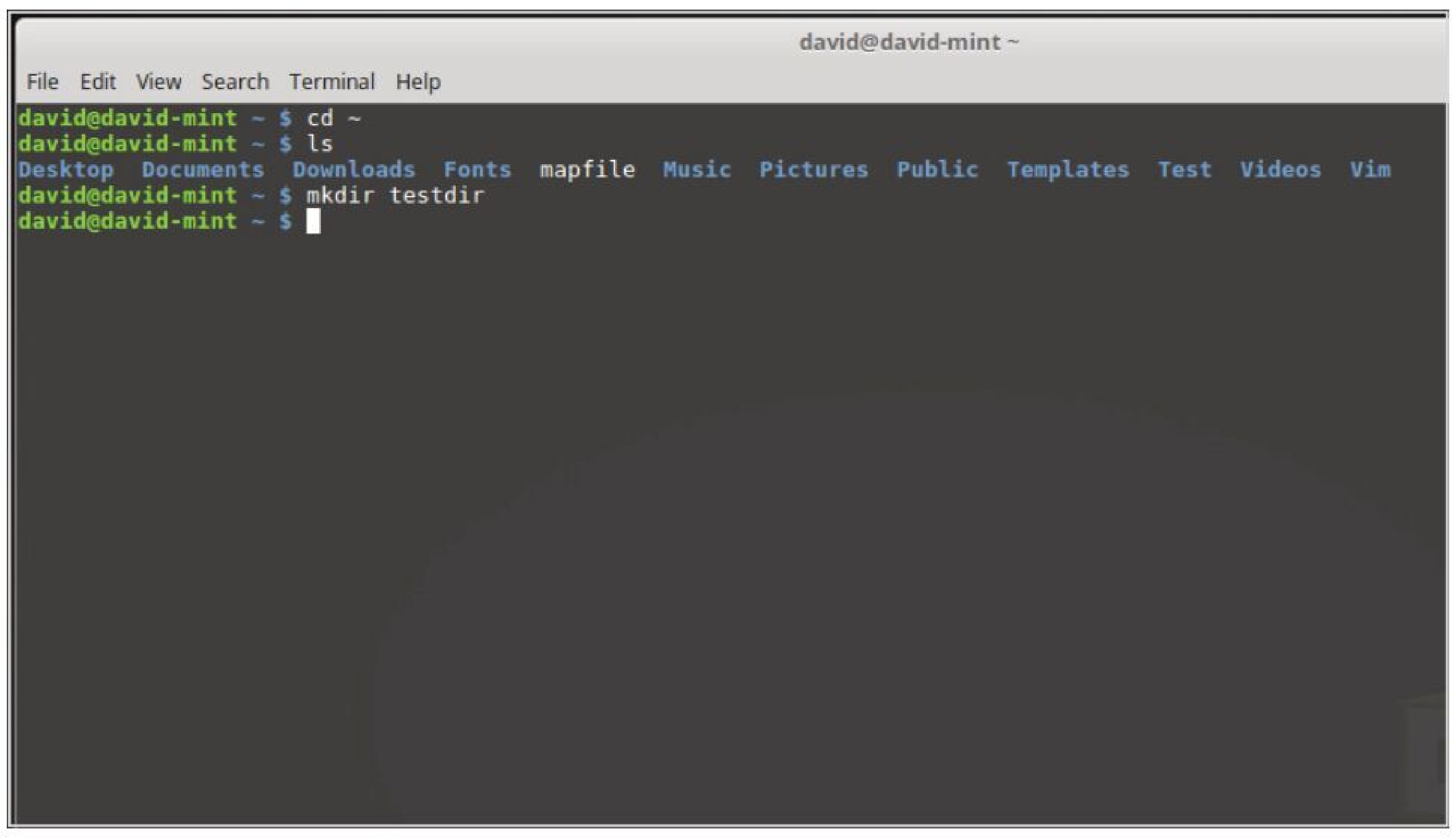
# Creating and Removing Directories

As with creating files in the Terminal, you can also create and delete directories, or folders if you prefer. Directories form the structure of your file system, without logical directories the filing system would be in utter chaos.

## MANAGING FOLDERS

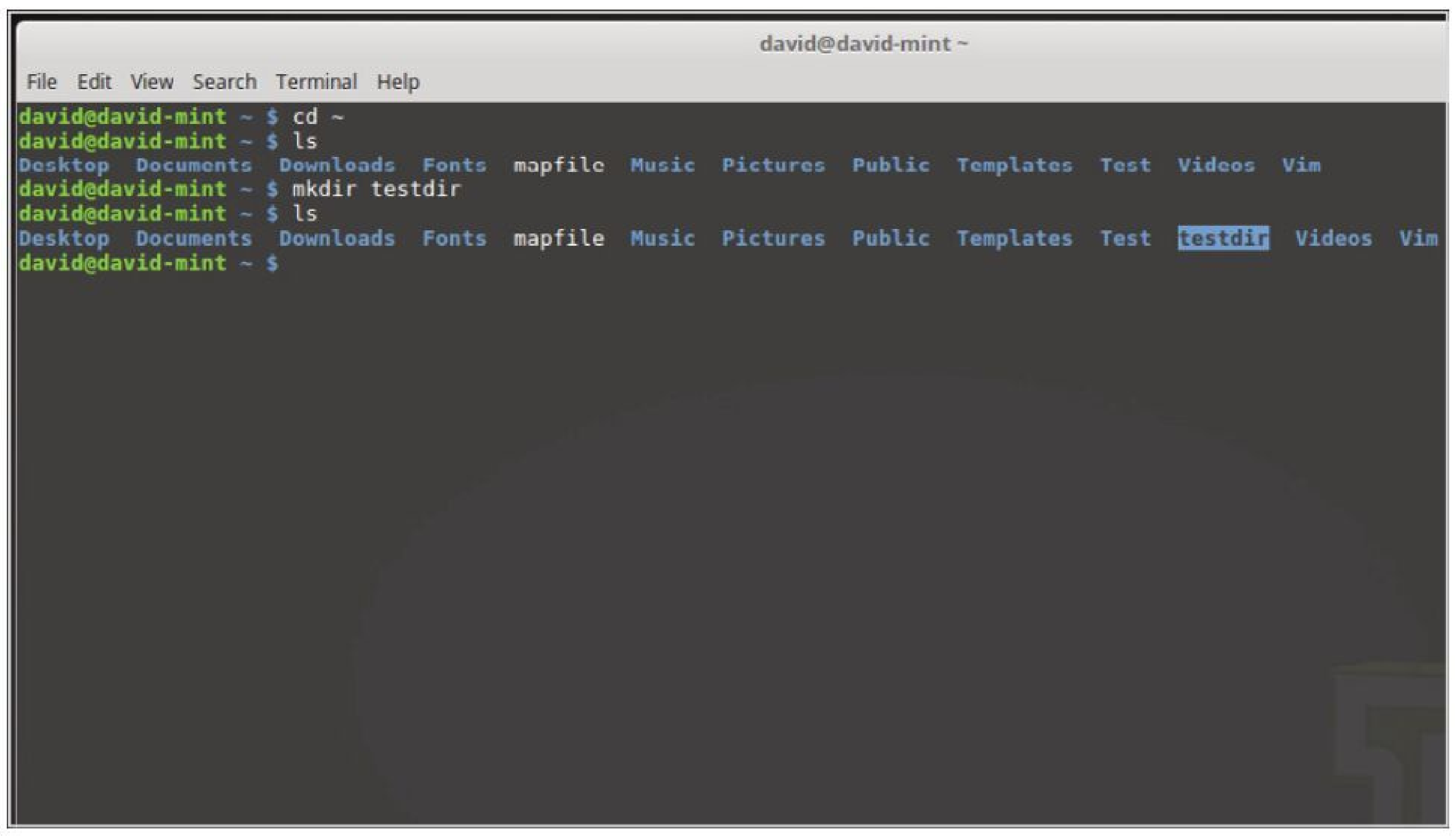
**Learning how to create and delete folders in the Terminal is an important Mint, and indeed Linux overall, skill to master. Here's the basics for you to try out.**

**STEP 1** With the Terminal open enter cd ~ to make sure you're in your own Home directory. Now enter ls to view the current folders you have housed in the Home directory. You'll notice that folders are labelled in Mint in cyan (light blue). Let's start by creating a new directory. Enter: `mkdir testdir`.



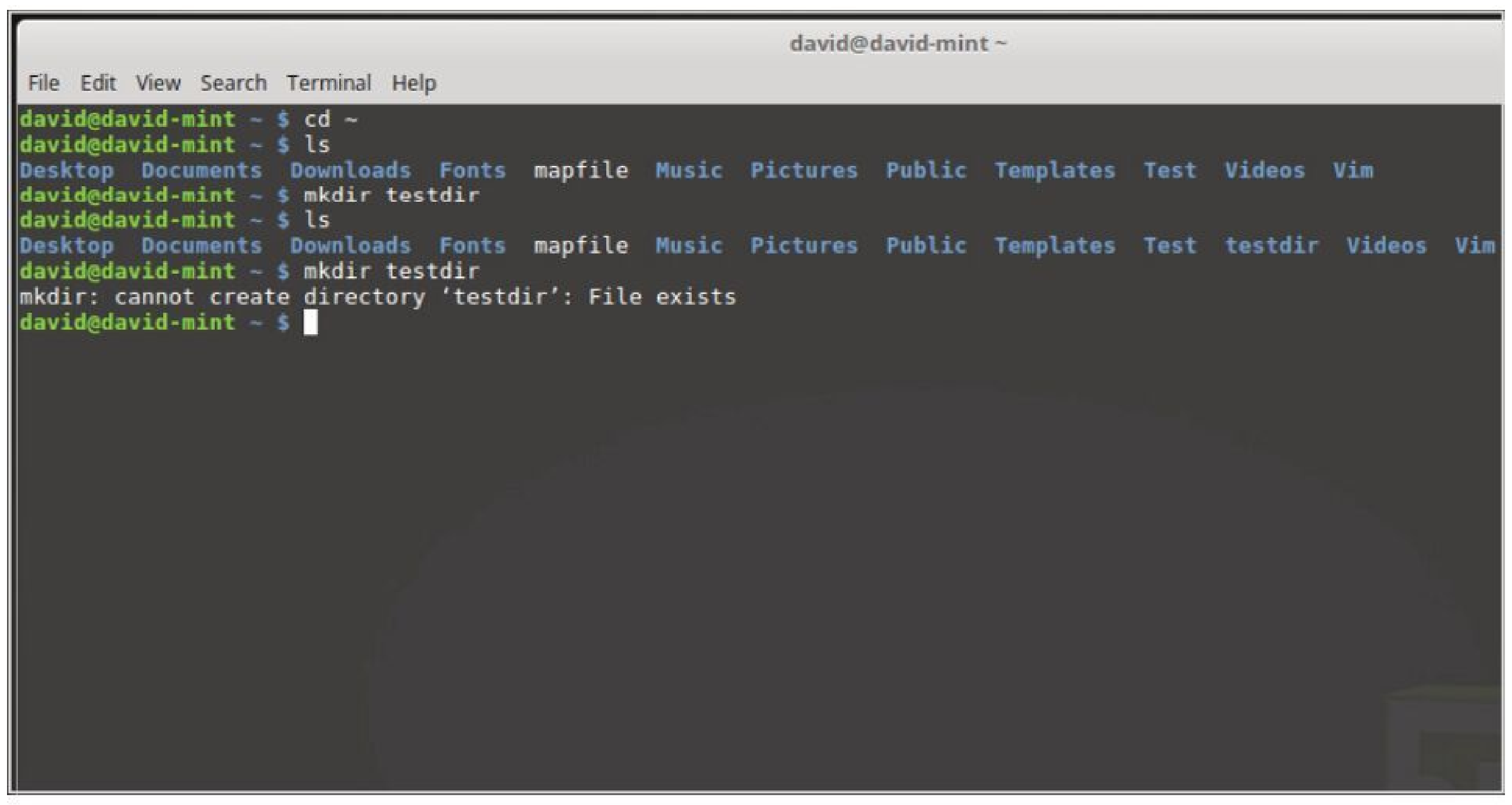
```
david@david-mint ~ $ cd ~
david@david-mint ~ $ ls
Desktop  Documents  Downloads  Fonts  mapfile  Music  Pictures  Public  Templates  Test  Videos  Vim
david@david-mint ~ $ mkdir testdir
david@david-mint ~ $ 
```

**STEP 2** If you now enter ls again, you'll see that the new directory, testdir, has been created alongside the other directories in the Home area. Obviously the command `mkdir` is what creates the directory, and no doubt you've already guessed it stands for Make Directory.



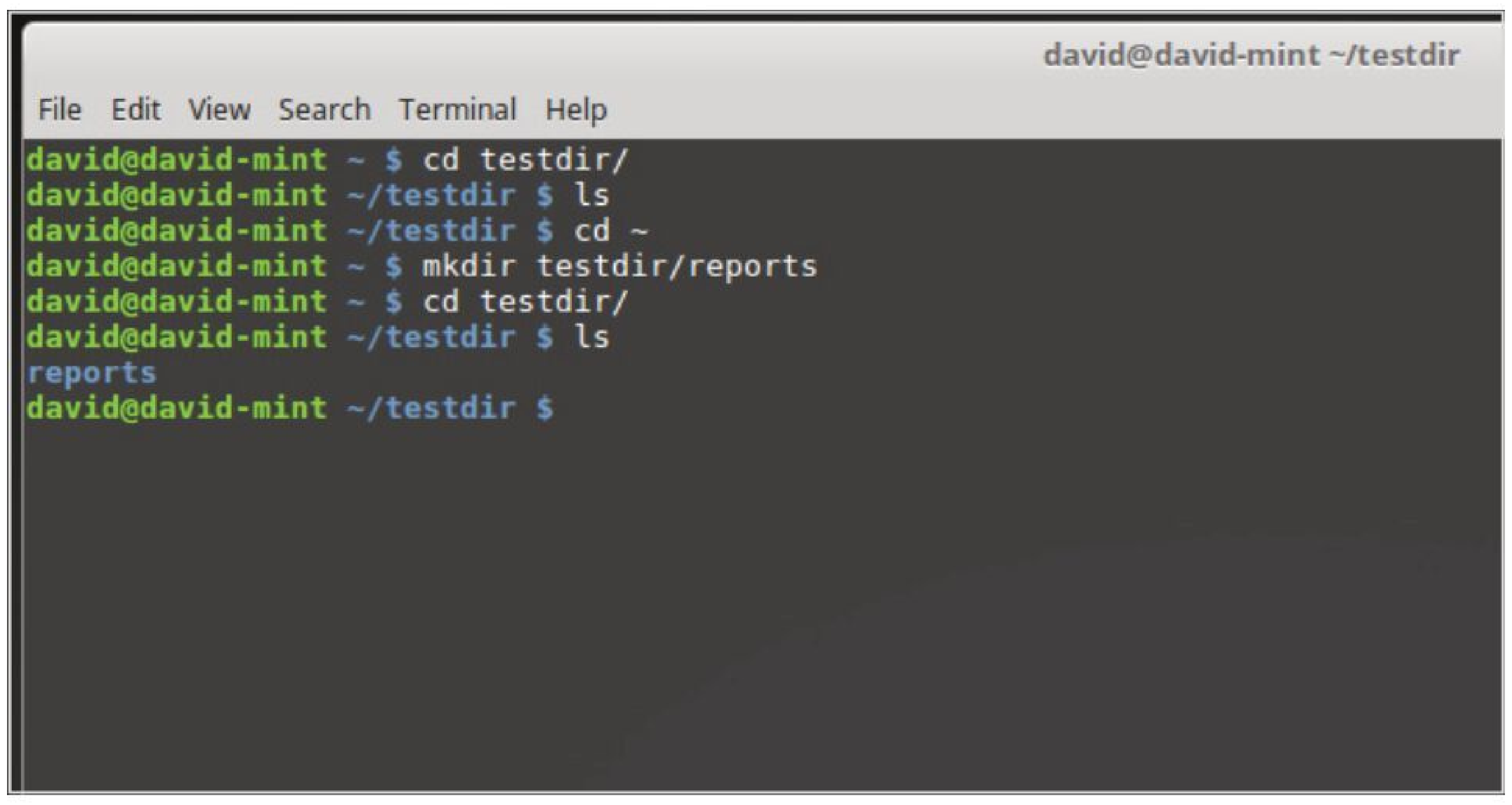
```
david@david-mint ~ $ cd ~
david@david-mint ~ $ ls
Desktop  Documents  Downloads  Fonts  mapfile  Music  Pictures  Public  Templates  Test  Videos  Vim
david@david-mint ~ $ mkdir testdir
david@david-mint ~ $ ls
Desktop  Documents  Downloads  Fonts  mapfile  Music  Pictures  Public  Templates  Test  testdir  Videos  Vim
david@david-mint ~ $
```

**STEP 3** If you were to enter the command again, `mkdir testdir`, you'll receive a message stating: `mkdir: cannot create directory 'testdir': File exists`. It goes without saying then, that you're only able to have one uniquely named directory within the current directory. However, as Linux is case-sensitive, you can have Testdir, TestDir, testDir and so on.



```
david@david-mint ~ $ cd ~
david@david-mint ~ $ ls
Desktop  Documents  Downloads  Fonts  mapfile  Music  Pictures  Public  Templates  Test  Videos  Vim
david@david-mint ~ $ mkdir testdir
david@david-mint ~ $ ls
Desktop  Documents  Downloads  Fonts  mapfile  Music  Pictures  Public  Templates  Test  testdir  Videos  Vim
david@david-mint ~ $ mkdir testdir
mkdir: cannot create directory 'testdir': File exists
david@david-mint ~ $ 
```

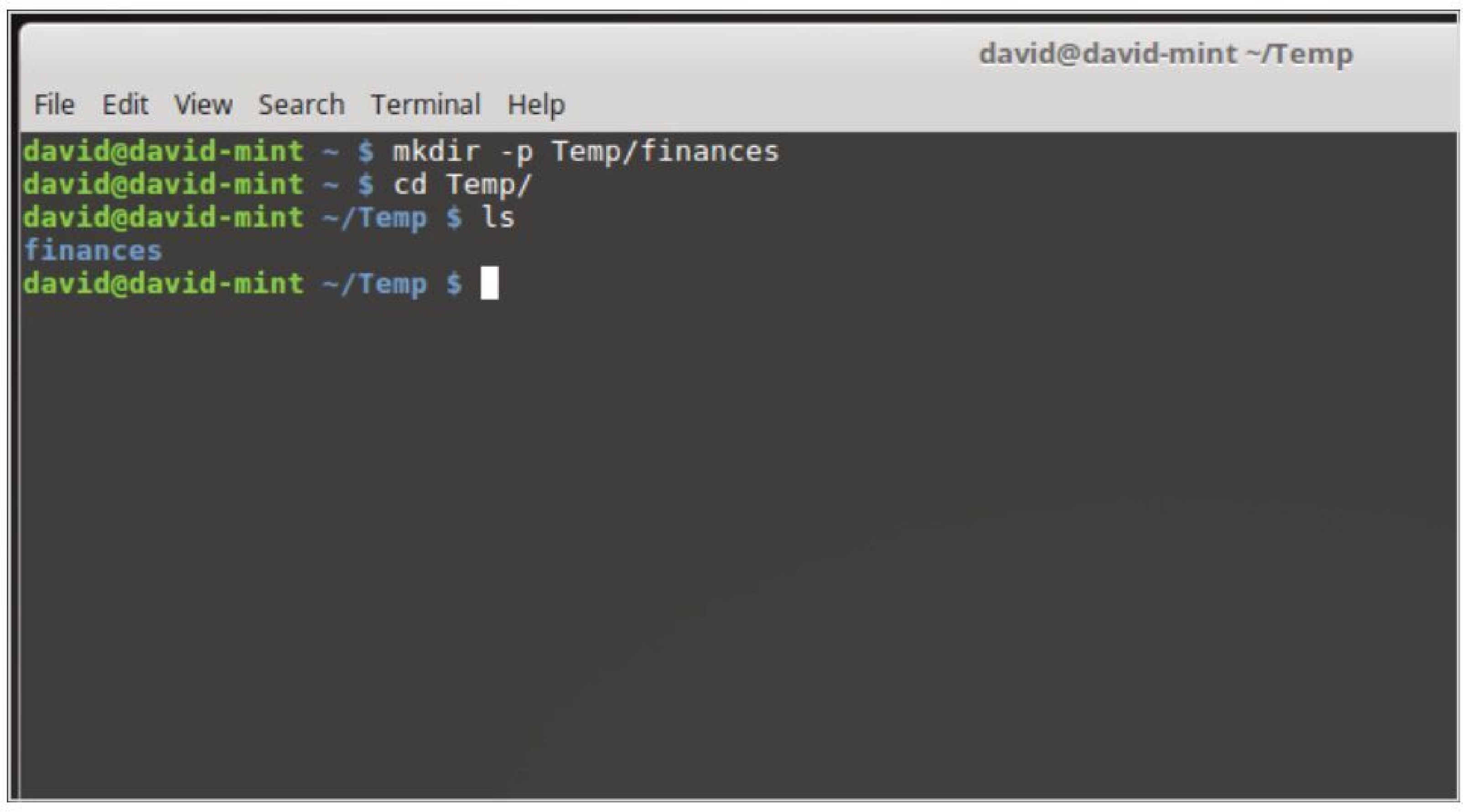
**STEP 4** You can create directories within directories you've already created. For example, enter the testdir directory with `cd testdir/` followed by ls to list the folder structure. Naturally there's nothing present, as you've just created the directory. Now drop back to Home with **cd ~**, and enter `mkdir testdir/reports`. Go back to the testdir, `cd testdir/`, and `ls` again.


david@david-mint ~/testdir
File Edit View Search Terminal Help

```
david@david-mint ~ $ cd testdir/
david@david-mint ~/testdir $ ls
david@david-mint ~/testdir $ cd ~
david@david-mint ~ $ mkdir testdir/reports
david@david-mint ~ $ cd testdir/
david@david-mint ~/testdir $ ls
reports
david@david-mint ~/testdir $
```

## STEP 5

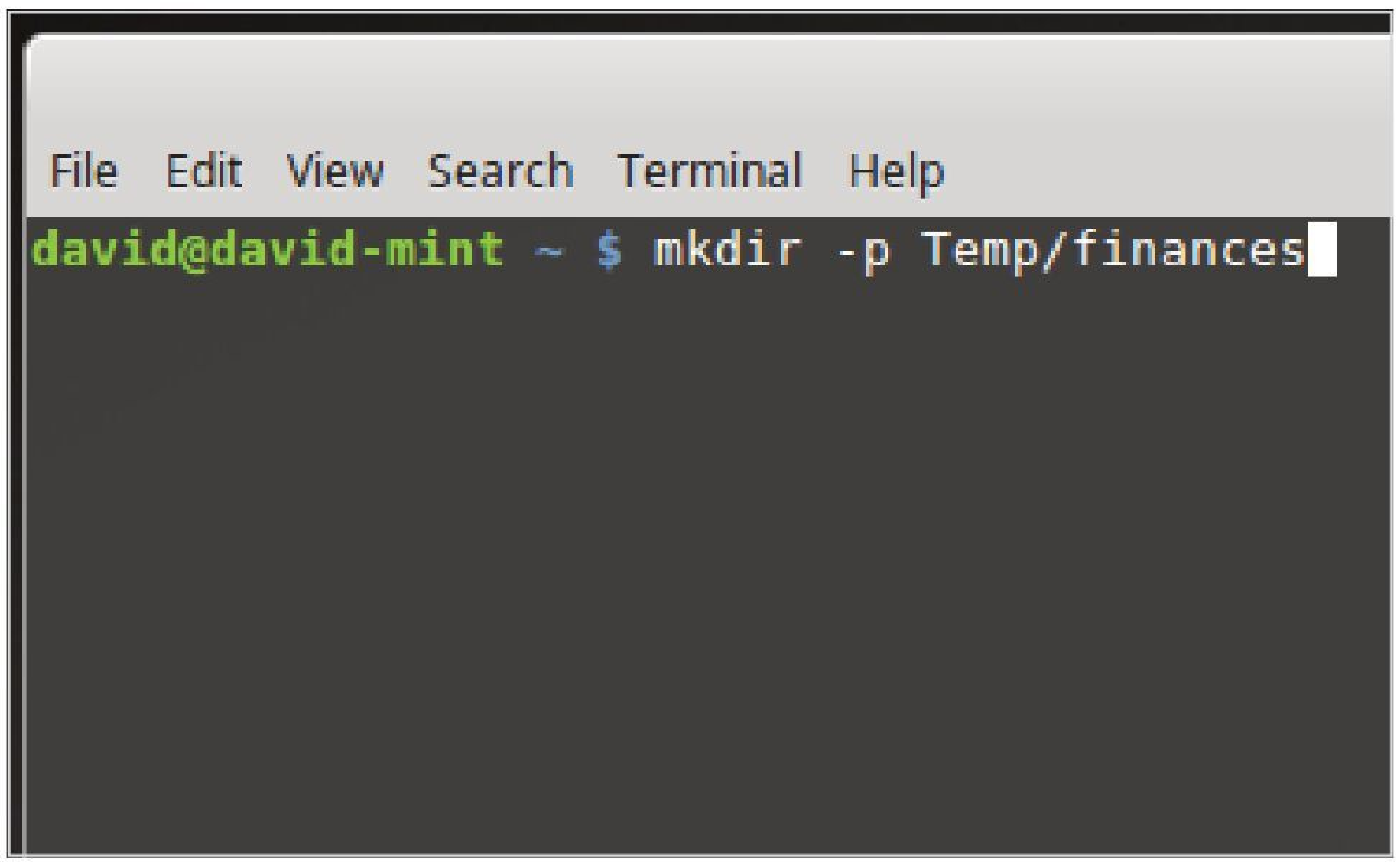
The command to create directories is quite logical, therefore. You'll create the directory, and any sub-directories within. However, what if you want to create a directory and a sub-directory in a single command? Make sure you're at Home (**cd ~**) and enter: `mkdir -p Temp/finances`. Now, **cd Temp/**, and **ls** to list the new directory.


david@david-mint ~/Temp
File Edit View Search Terminal Help

```
david@david-mint ~ $ mkdir -p Temp/finances
david@david-mint ~ $ cd Temp/
david@david-mint ~/Temp $ ls
finances
david@david-mint ~/Temp $ █
```

## STEP 6

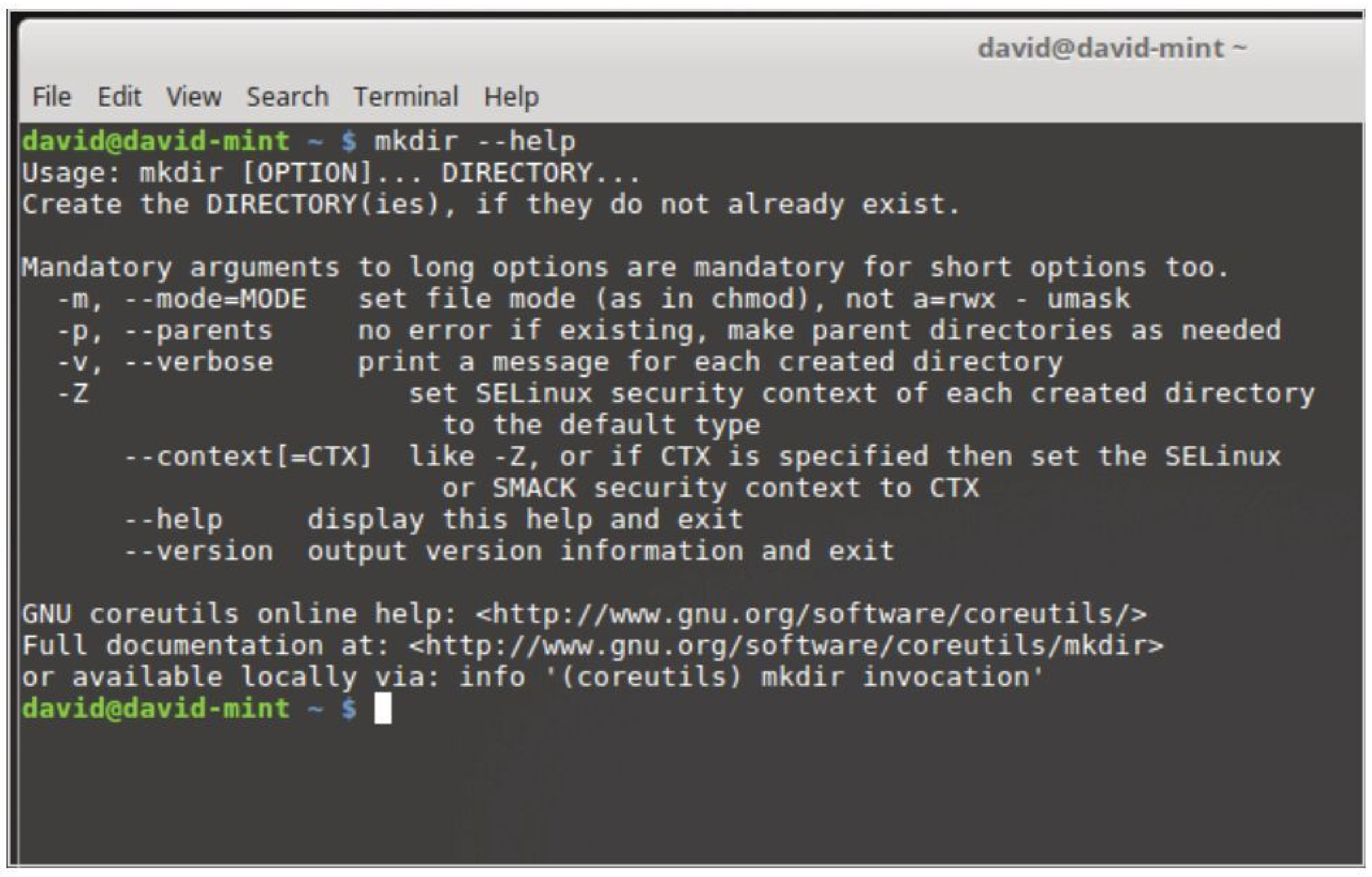
The **-p** option is what enables the mkdir command to create the sub-directory as well as the parent directory. In Linux, commands always follow the same structure: Command, Option, and Argument. In the previous step example, command (**mkdir**), option (**-p**), and argument (**Temp/finances**).


File Edit View Search Terminal Help

```
david@david-mint ~ $ mkdir -p Temp/finances█
```

## STEP 7

If you want to drill down into the various options available for the mkdir command, you can enter `mkdir --help` into the Terminal. This will provide a quick help guide detailing the options and how the command structure works.


david@david-mint ~
File Edit View Search Terminal Help

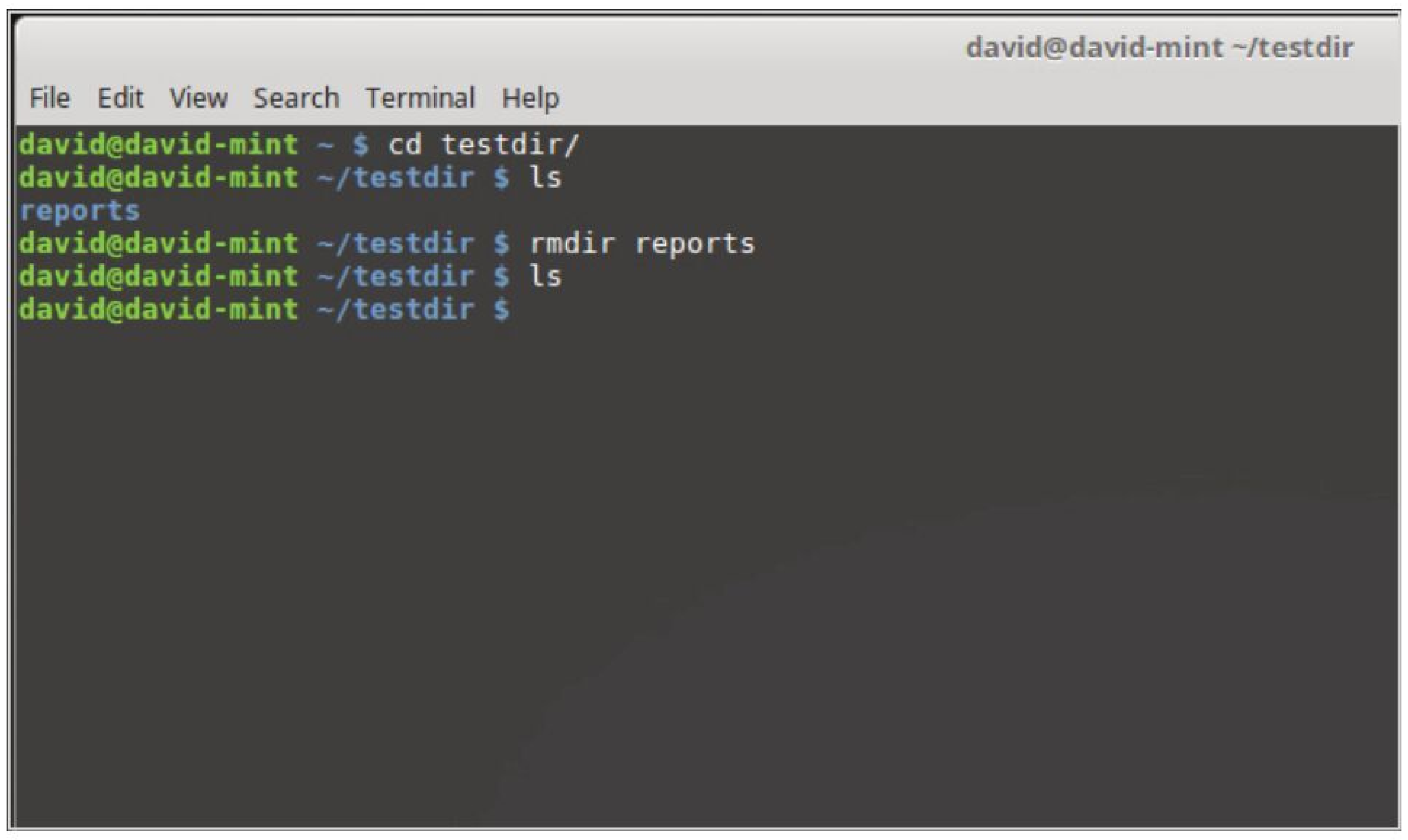
```
david@david-mint ~ $ mkdir --help
Usage: mkdir [OPTION]... DIRECTORY...
Create the DIRECTORY(ies), if they do not already exist.

Mandatory arguments to long options are mandatory for short options too.
  -m, --mode=MODE   set file mode (as in chmod), not a=rwx - umask
  -p, --parents     no error if existing, make parent directories as needed
  -v, --verbose     print a message for each created directory
  -Z                   set SELinux security context of each created directory
                         to the default type
      --context[=CTX]  like -Z, or if CTX is specified then set the SELinux
                         or SMACK security context to CTX
      --help     display this help and exit
      --version  output version information and exit

GNU coreutils online help: <http://www.gnu.org/software/coreutils/>
Full documentation at: <http://www.gnu.org/software/coreutils/mkdir>
or available locally via: info '(coreutils) mkdir invocation'
david@david-mint ~ $ █
```

## STEP 8

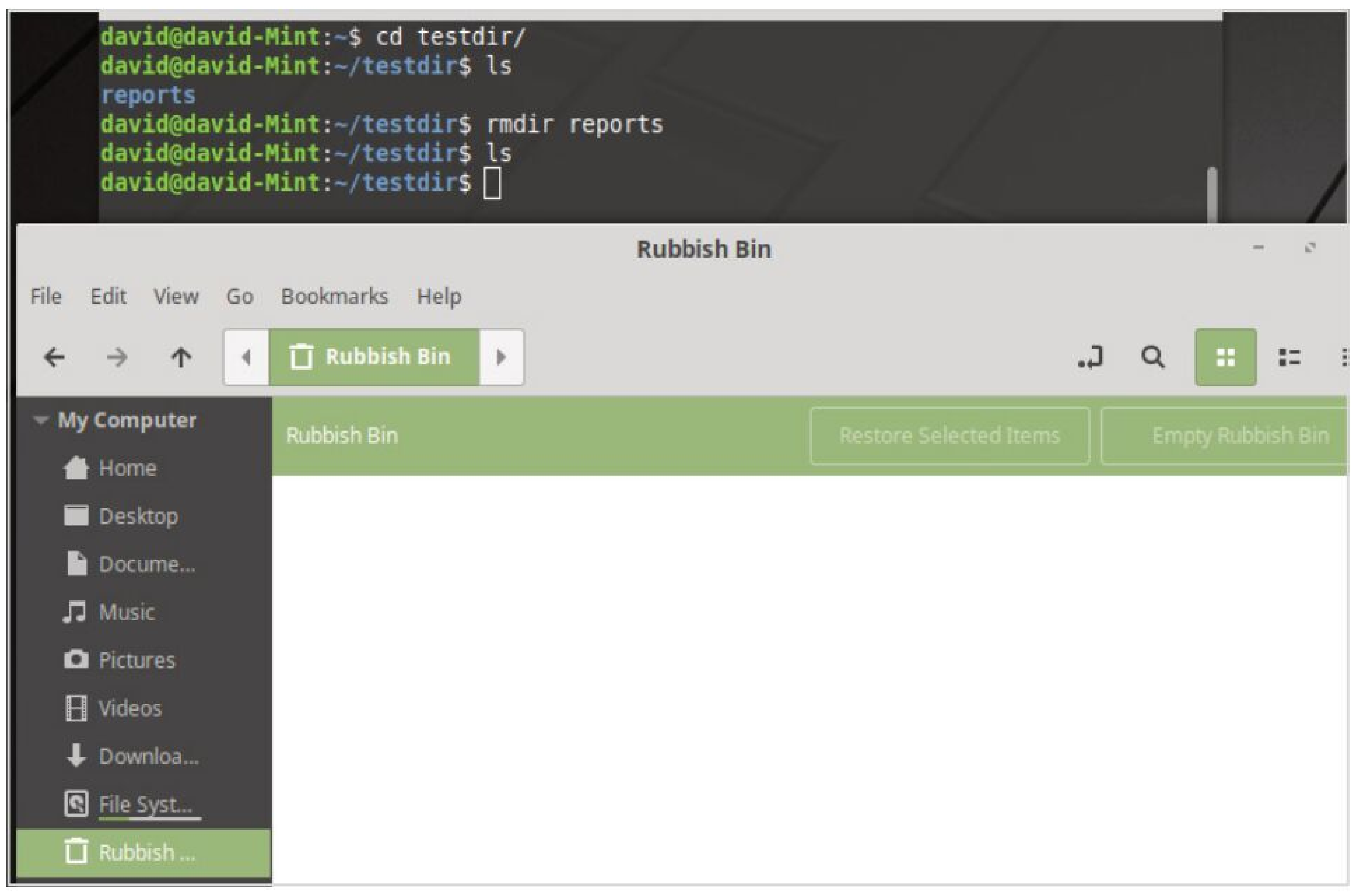
Now that we've created some directories, let's see about removing them. Start by entering the testdir directory and listing its contents: **cd testdir/**, then **ls**. The previously created reports sub-directory is present. One way to remove it is to enter: **rmdir reports**, then **ls** again to confirm it's not there.


david@david-mint ~/testdir
File Edit View Search Terminal Help

```
david@david-mint ~ $ cd testdir/
david@david-mint ~/testdir $ ls
reports
david@david-mint ~/testdir $ rmdir reports
david@david-mint ~/testdir $ ls
david@david-mint ~/testdir $
```

## STEP 9

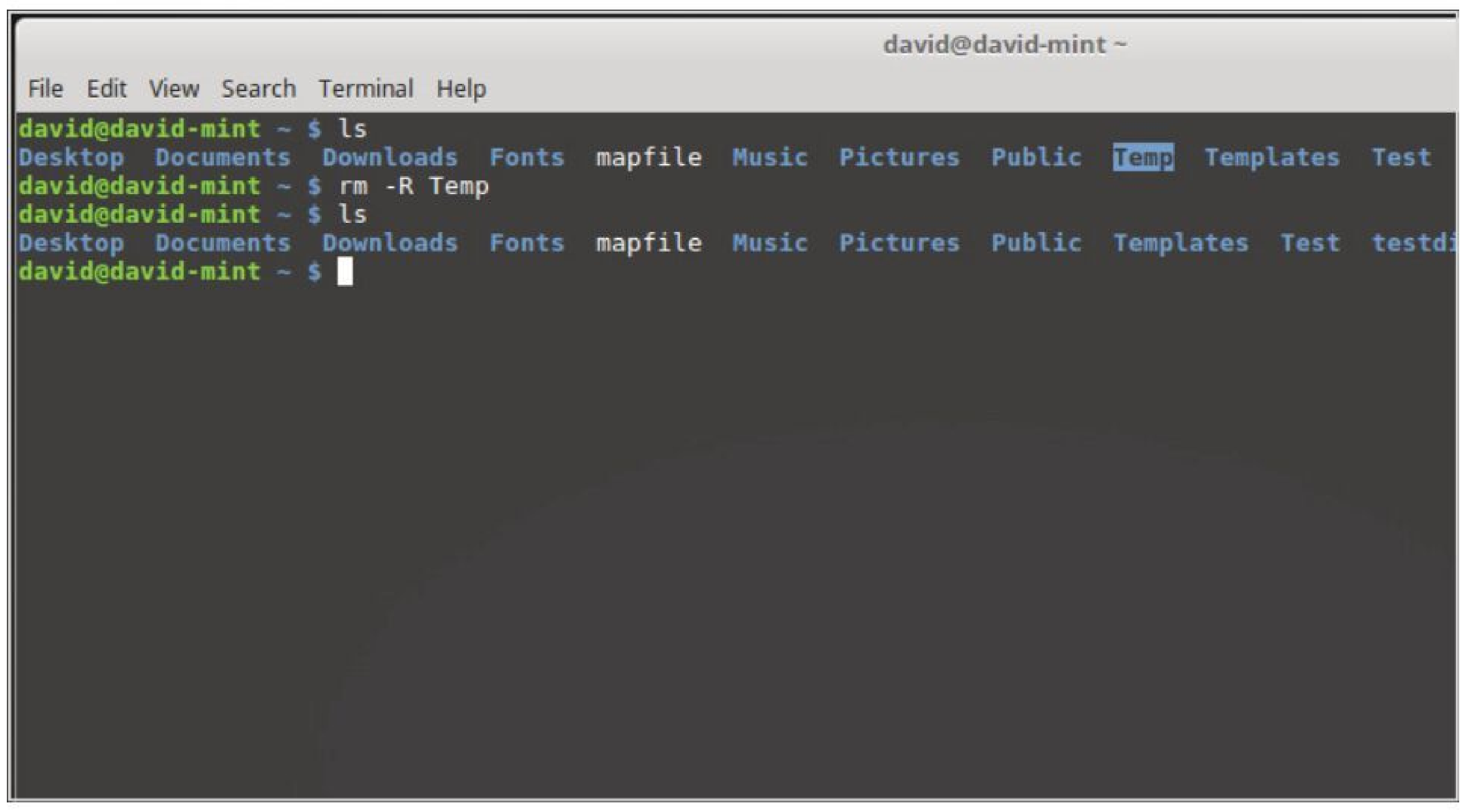
A quick warning: removing a directory in the Terminal doesn't place it in the Mint Rubbish Bin, via Nemo file manager. The same goes for any files, too. If you remove a directory from the Terminal command then it's gone for good.


Rubbish Bin
File Edit View Go Bookmarks Help
Rubbish Bin
My Computer
Home
Desktop
Docume...
Music
Pictures
Videos
Downloa...
File Syst...
Rubbish ...
Rubbish Bin
Restore Selected Items
Empty Rubbish Bin

```
david@david-Mint:~$ cd testdir/
david@david-Mint:~/testdir$ ls
reports
david@david-Mint:~/testdir$ rmdir reports
david@david-Mint:~/testdir$ ls
david@david-Mint:~/testdir$ ▯
```

## STEP 10

Rmdir will only remove empty directories, to remove directories containing sub-directories, or even files, you'll need to use the rm command with the -R option. For example, on the Temp/finance directories, use `rm -R Temp`. A quick ls reveals that the parent folder and all of its contents are removed. Careful when using this command.


david@david-mint ~
File Edit View Search Terminal Help

```
david@david-mint ~ $ ls
Desktop  Documents  Downloads  Fonts  mapfile  Music  Pictures  Public  Temp  Templates  Test
david@david-mint ~ $ rm -R Temp
david@david-mint ~ $ ls
Desktop  Documents  Downloads  Fonts  mapfile  Music  Pictures  Public  Templates  Test  testdi
david@david-mint ~ $ █
```

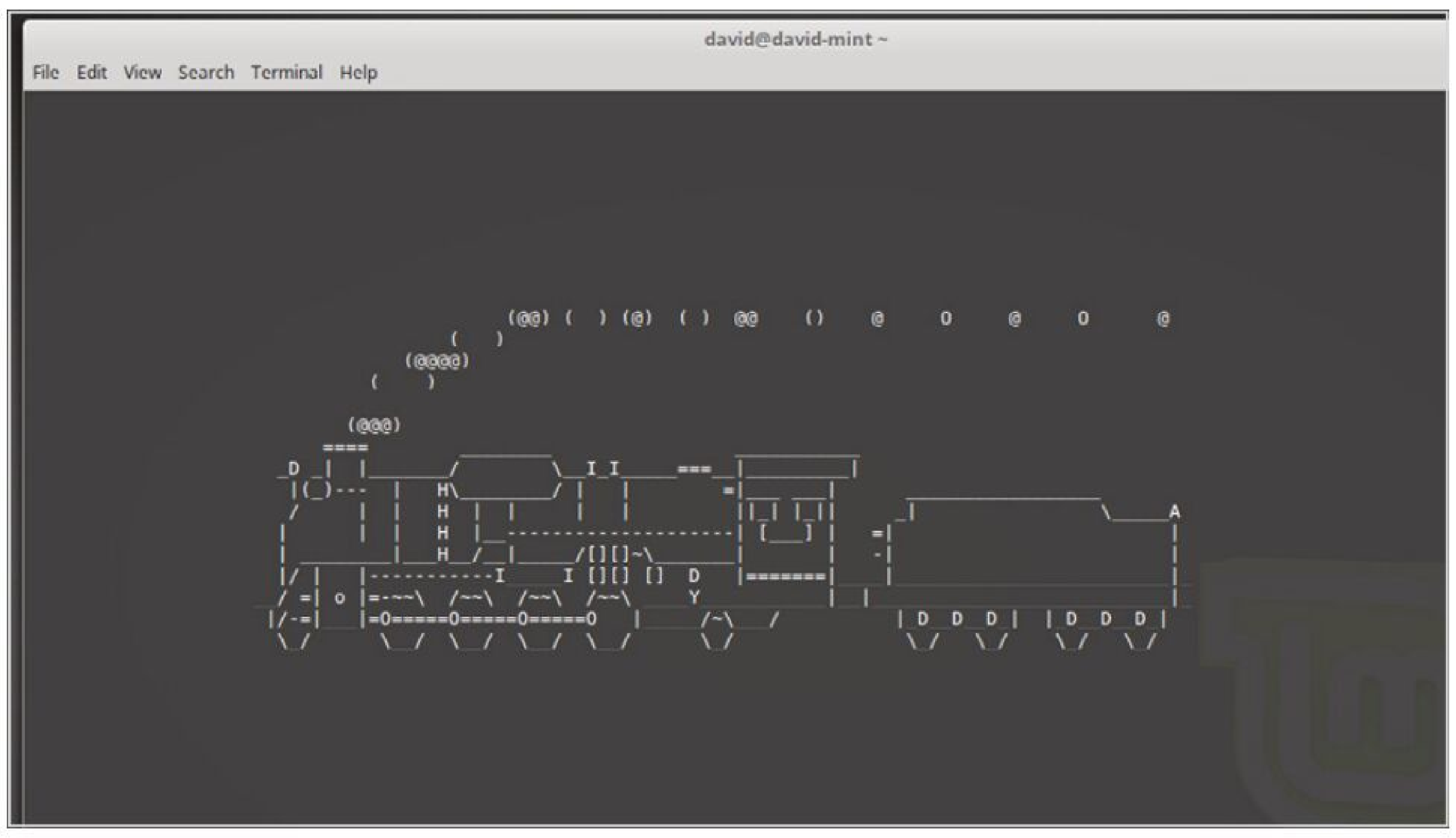
# Fun Things to do in the Terminal

Despite the seriousness of an operating system, the Linux community are certainly no strangers to a bit of fun. The developers over the years have created and inserted all manner of fun and odd elements into the Terminal.

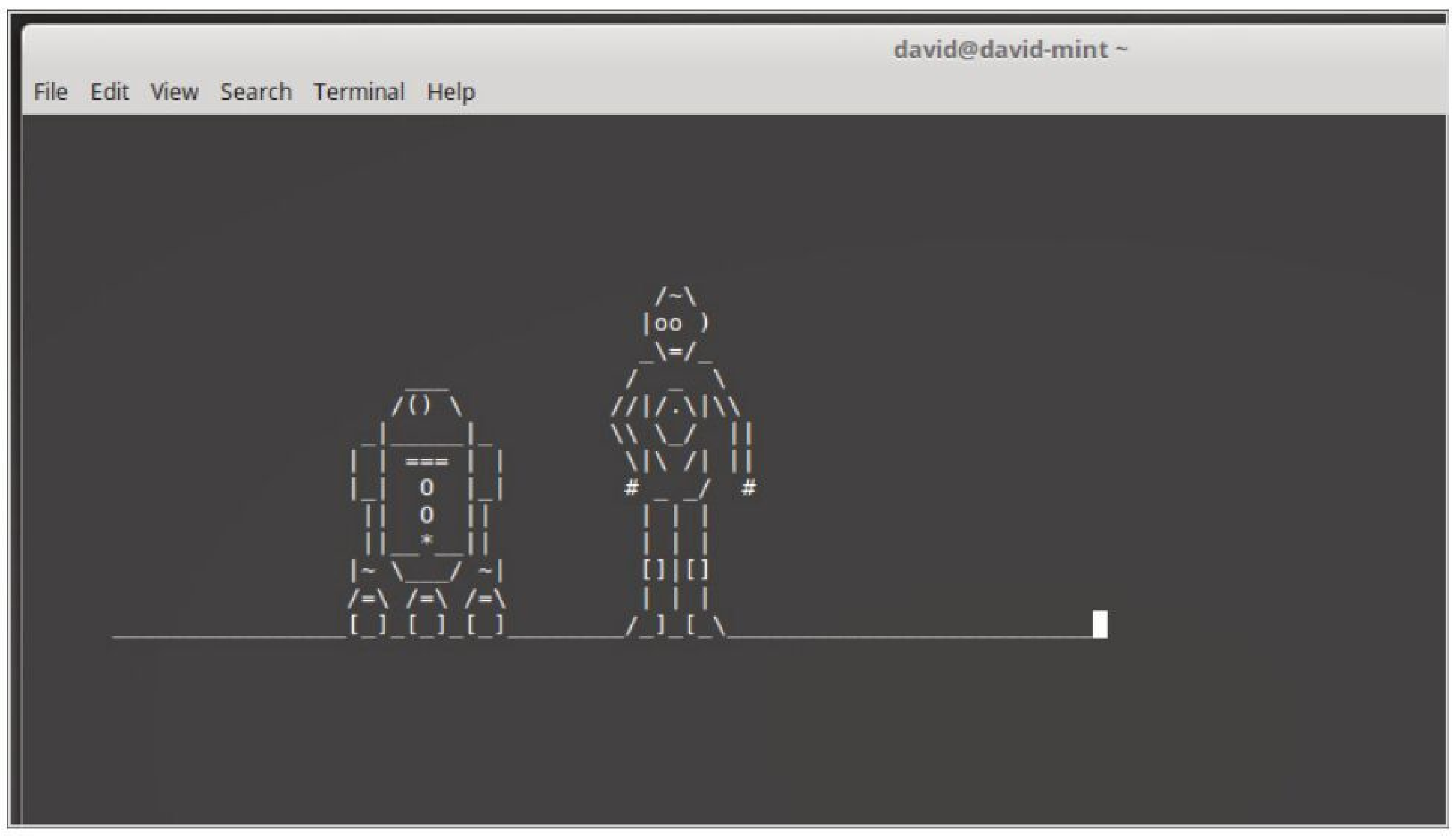
## TERMINAL FUN

**You'll be working exclusively in the Terminal for these next two sections, so start warming up your fingers. After all, all work and no play… as the saying goes.**

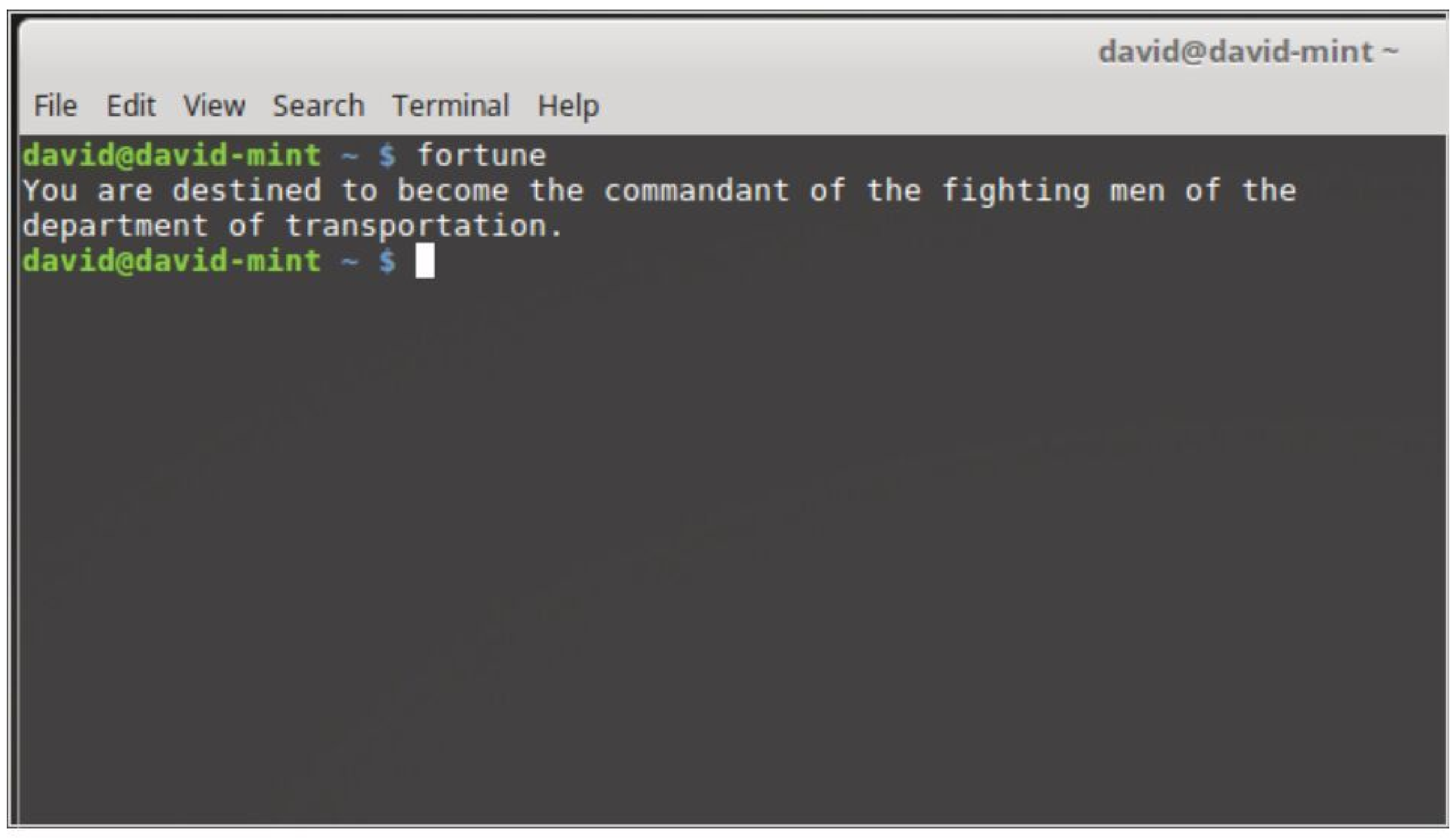
**STEP 1** The first command we're going to use is **sl**, it's not installed by default so enter: `sudo apt-get install sl`. The command can be run with **sl** and when executed will display a Steam Locomotive travelling across the screen (hence 'sl'). Entering `LS`, note the upper case, also works.


david@david-mint ~
File Edit View Search Terminal Help

**STEP 2** Fans of Star Wars even get a fix when it comes to the Terminal. By linking to a remote server via the telnet command, you can watch Episode IV: A New Hope being played out, albeit in ASCII. To view this spectacle, enter: `telnet towel.blinkenlights.nl`.

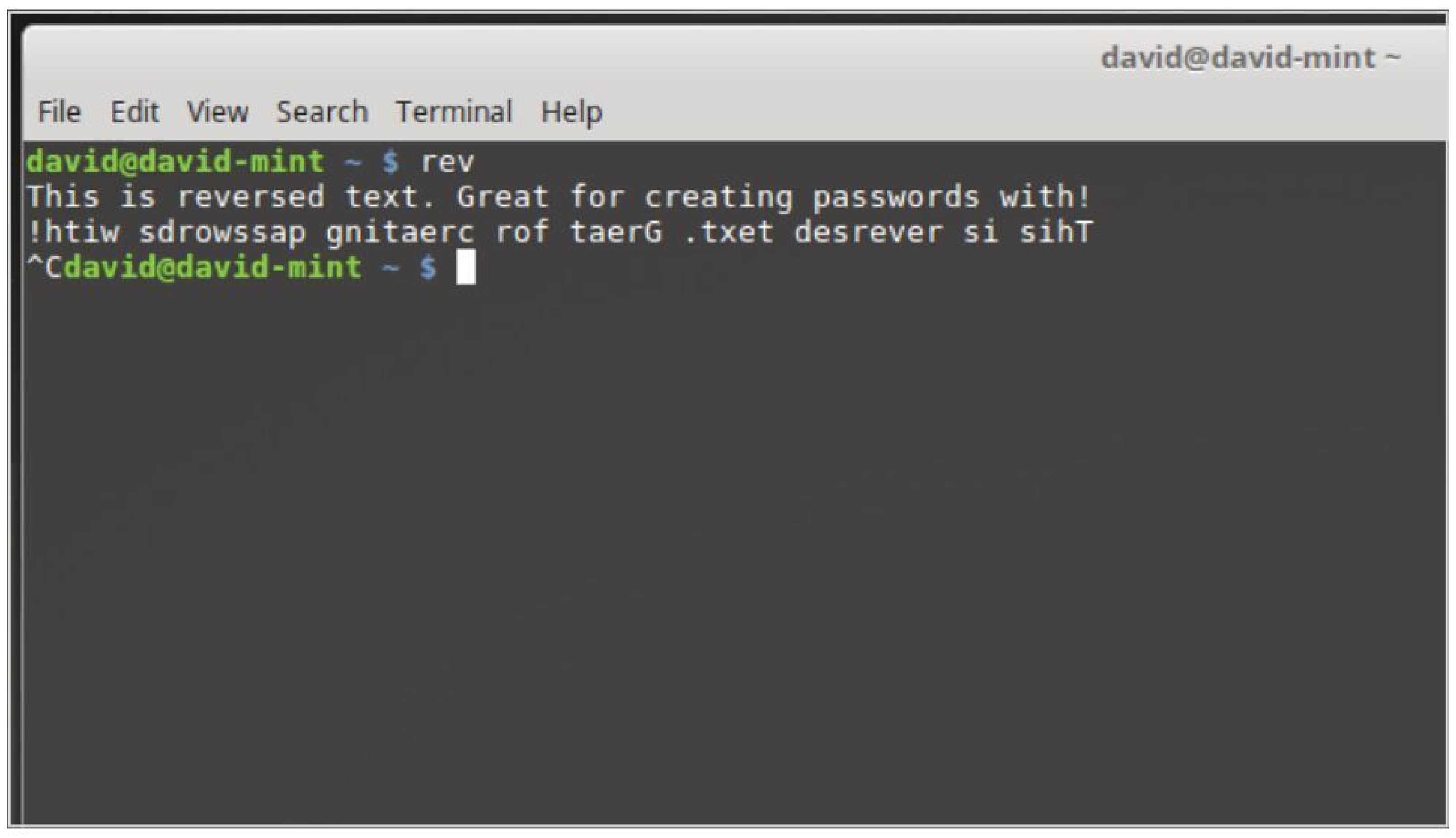

david@david-mint ~
File Edit View Search Terminal Help

**STEP 3** If you've ever fancied having the computer read a random fortune out to you, then you're in luck. Most distros require you to install the fortune app, however Linux Mint differs somewhat by having it already pre-loaded. All you need to do is enter the command `fortune` into the Terminal, and enjoy.


david@david-mint ~
File Edit View Search Terminal Help

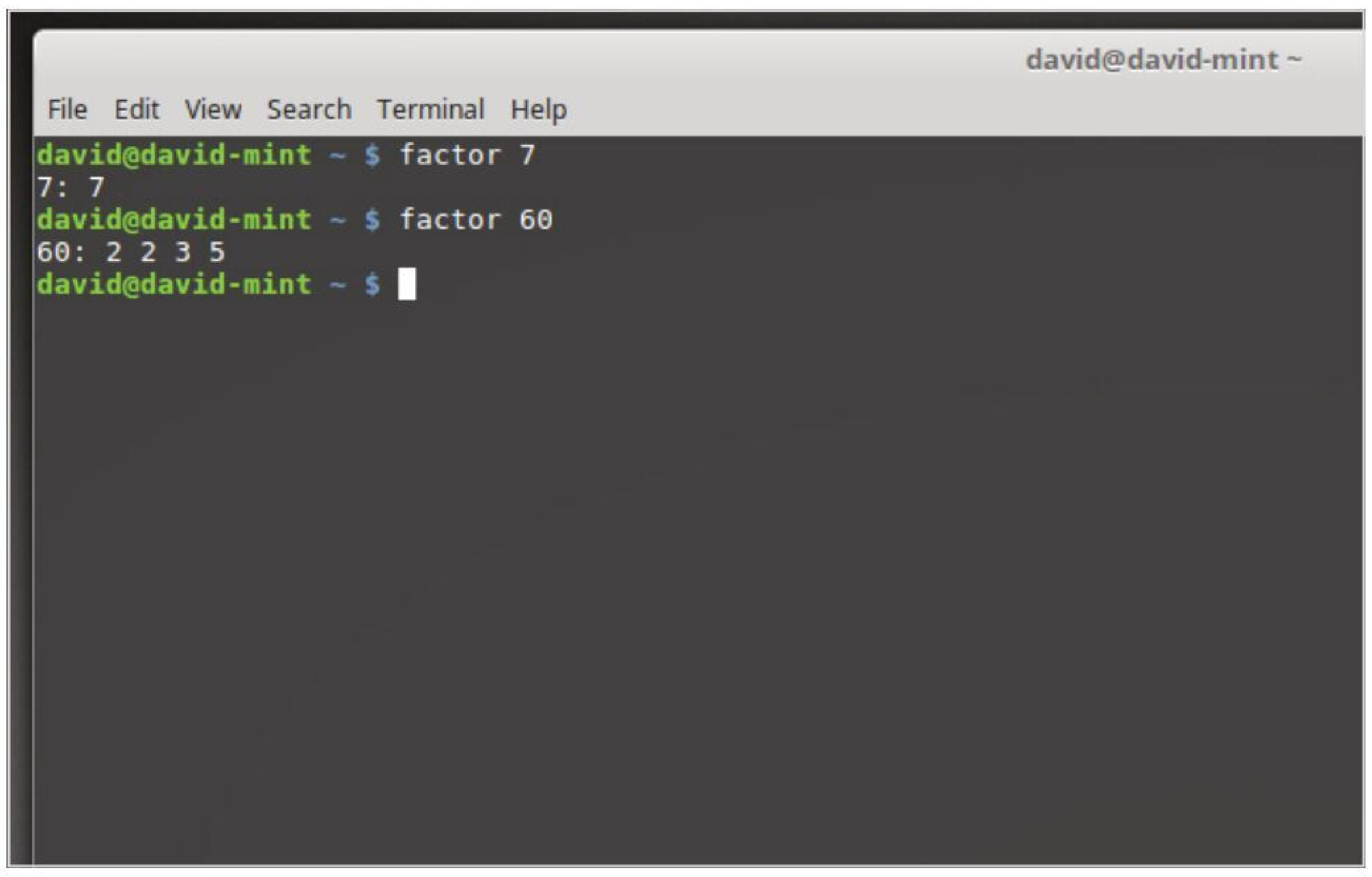
```
david@david-mint ~ $ fortune
You are destined to become the commandant of the fighting men of the
department of transportation.
david@david-mint ~ $
```

**STEP 4** The **rev** command is certainly interesting, and at first what seems a quite useless addition to the OS. However, it can be used to create some seemingly unbreakable passwords. Enter: `rev`, now type some text, when you press **Enter** next, everything you typed in will be reversed. Press **Ctrl+C** to exit.


david@david-mint ~
File Edit View Search Terminal Help

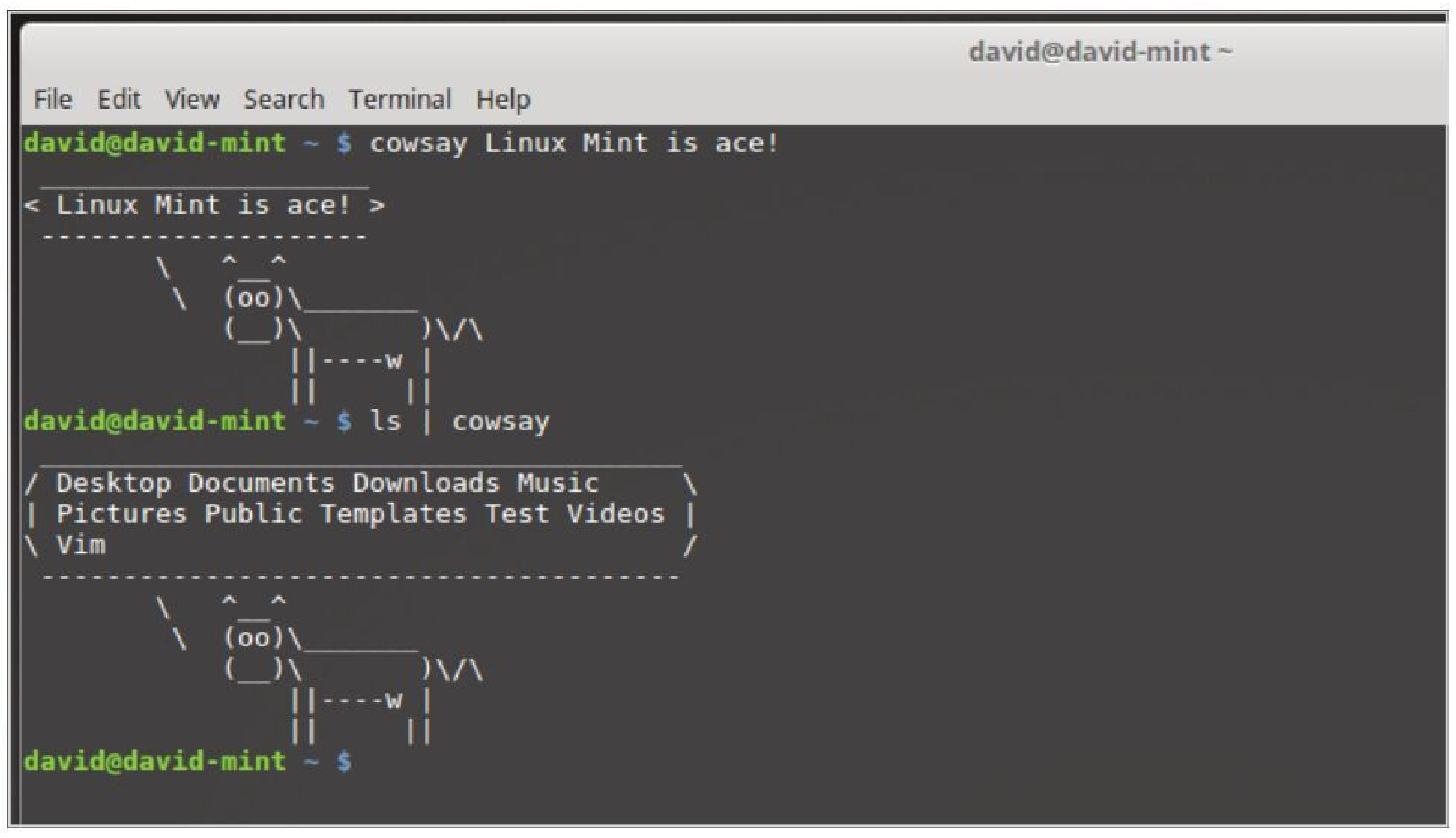
```
david@david-mint ~ $ rev
This is reversed text. Great for creating passwords with!
!htiw sdrowssap gnitaerc rof taerG .txet desrever si sihT
^Cdavid@david-mint ~ $
```

**STEP 5** If you're stuck trying to work out all the possible factors for any particular number, simply enter `factor` followed by the number. For example, `factor 7` doesn't offer much output, whereas `factor 60` displays more.



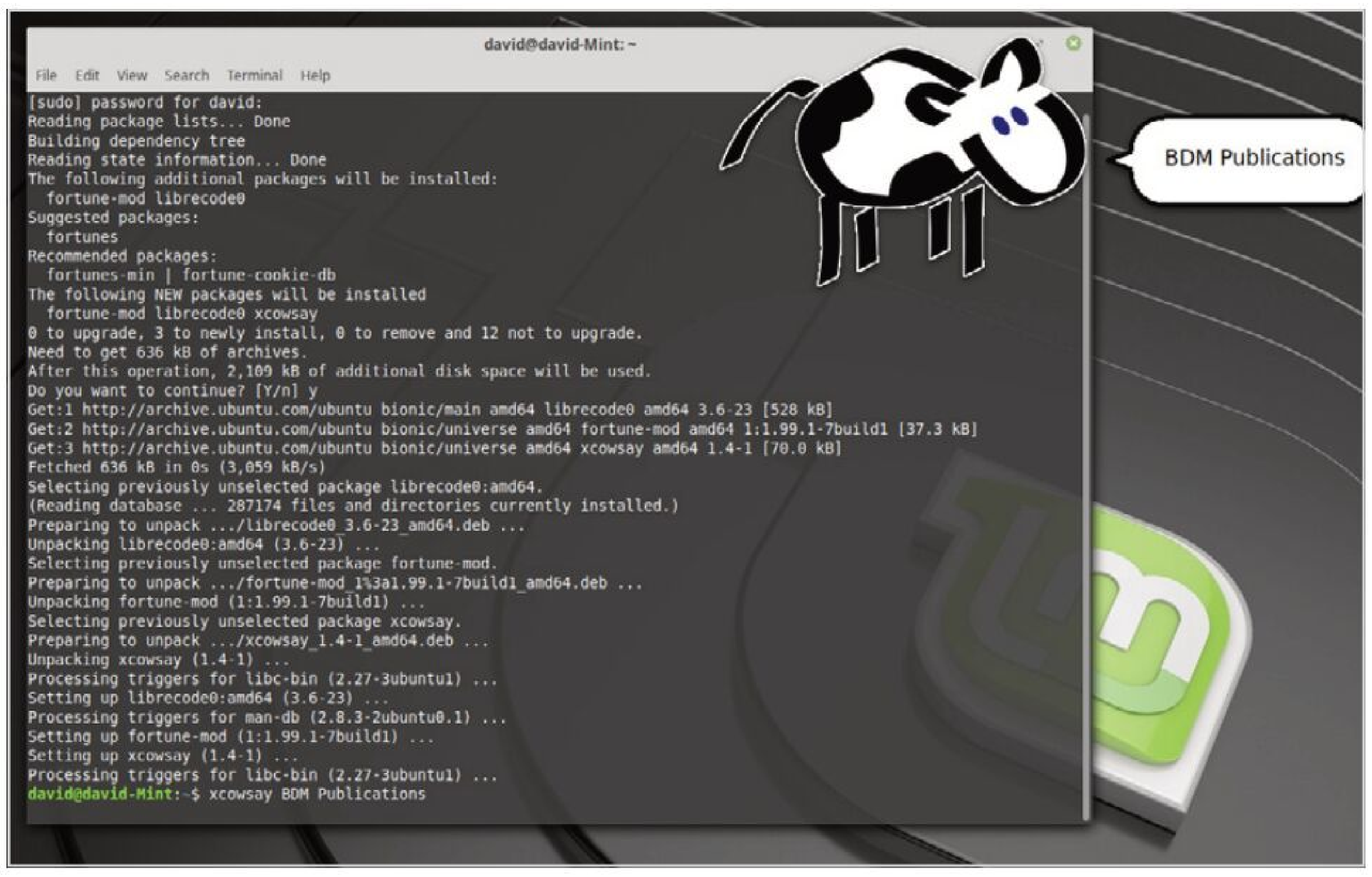
```
david@david-mint ~ $ factor 7
7: 7
david@david-mint ~ $ factor 60
60: 2 2 3 5
david@david-mint ~ $ 
```

**STEP 6** There's a fine line between the rather cool and really-quite-weird. Having an ASCII cow repeat text to you could potentially fall in the latter. Enter `cowsay` followed by any text you want, such as: `cowsay Linux Mint is ace!`. In fact, you can even output the **ls** command through the cow, by entering: `ls | cowsay`.



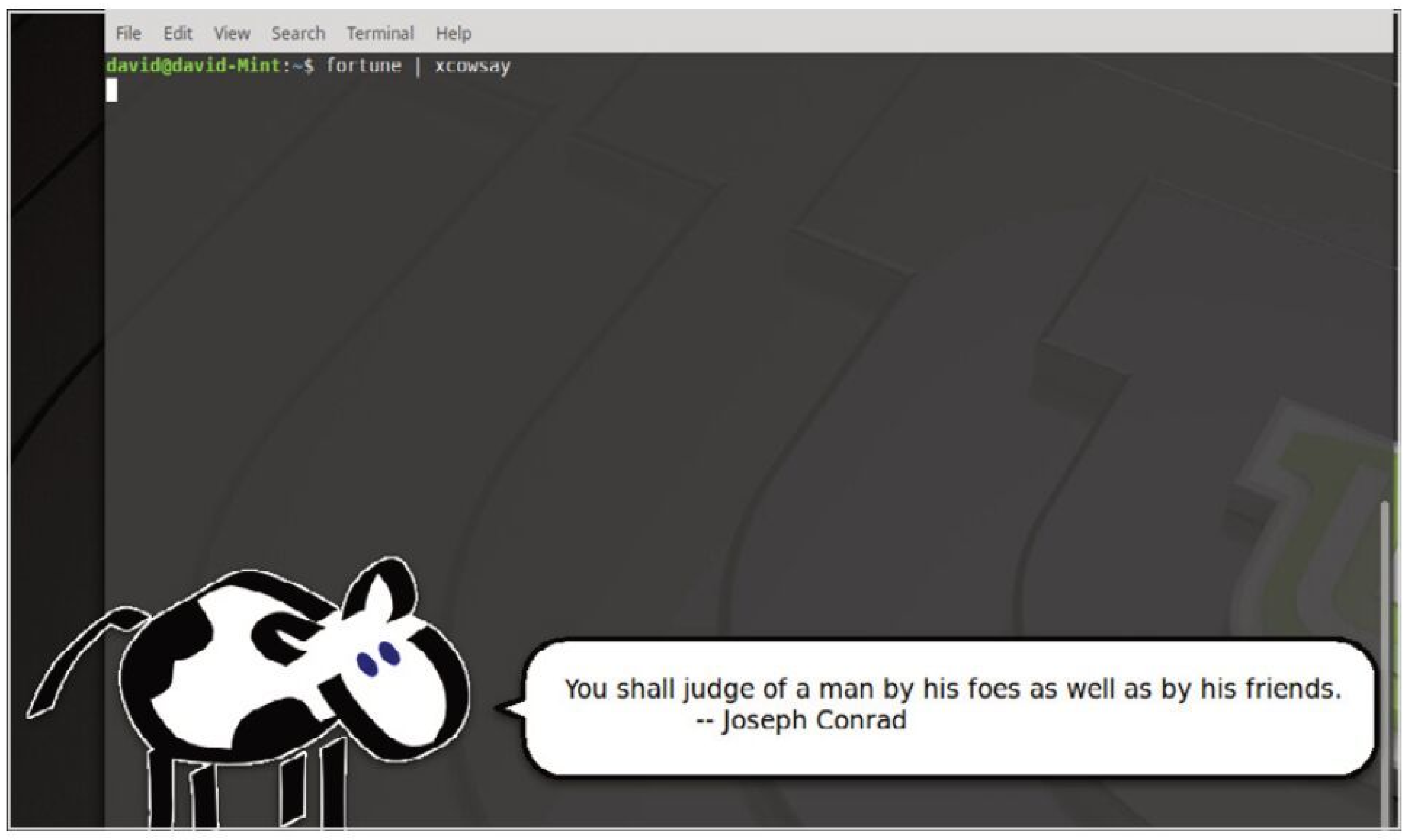
```
david@david-mint ~ $ cowsay Linux Mint is ace!
 ____________________
< Linux Mint is ace! >
 --------------------
        \   ^__^
         \  (oo)\_______
            (__)\       )\/\
                ||----w |
                ||     ||
david@david-mint ~ $ ls | cowsay
 ________________________________________
/ Desktop Documents Downloads Music      \
| Pictures Public Templates Test Videos |
\ Vim                                    /
 ----------------------------------------
        \   ^__^
         \  (oo)\_______
            (__)\       )\/\
                ||----w |
                ||     ||
david@david-mint ~ $
```

**STEP 7** To further the cow element, there's even a graphical, i.e. non-Terminal, cow available. Install it with: `sudo apt-get install xcowsay`, then when it's installed enter something similar to cowsay, such as: `xcowsay BDM Publications`.



```
[sudo] password for david:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  fortune-mod librecode0
Suggested packages:
  fortunes
Recommended packages:
  fortunes-min | fortune-cookie-db
The following NEW packages will be installed
  fortune-mod librecode0 xcowsay
0 to upgrade, 3 to newly install, 0 to remove and 12 not to upgrade.
Need to get 636 kB of archives.
After this operation, 2,109 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://archive.ubuntu.com/ubuntu bionic/main amd64 librecode0 amd64 3.6-23 [528 kB]
Get:2 http://archive.ubuntu.com/ubuntu bionic/universe amd64 fortune-mod amd64 1:1.99.1-7build1 [37.3 kB]
Get:3 http://archive.ubuntu.com/ubuntu bionic/universe amd64 xcowsay amd64 1.4-1 [70.0 kB]
Fetched 636 kB in 0s (3,059 kB/s)
Selecting previously unselected package librecode0:amd64.
(Reading database ... 287174 files and directories currently installed.)
Preparing to unpack .../librecode0_3.6-23_amd64.deb ...
Unpacking librecode0:amd64 (3.6-23) ...
Selecting previously unselected package fortune-mod.
Preparing to unpack .../fortune-mod_1%3a1.99.1-7build1_amd64.deb ...
Unpacking fortune-mod (1:1.99.1-7build1) ...
Selecting previously unselected package xcowsay.
Preparing to unpack .../xcowsay_1.4-1_amd64.deb ...
Unpacking xcowsay (1.4-1) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Setting up librecode0:amd64 (3.6-23) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Setting up fortune-mod (1:1.99.1-7build1) ...
Setting up xcowsay (1.4-1) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
david@david-Mint:~$ xcowsay BDM Publications
```

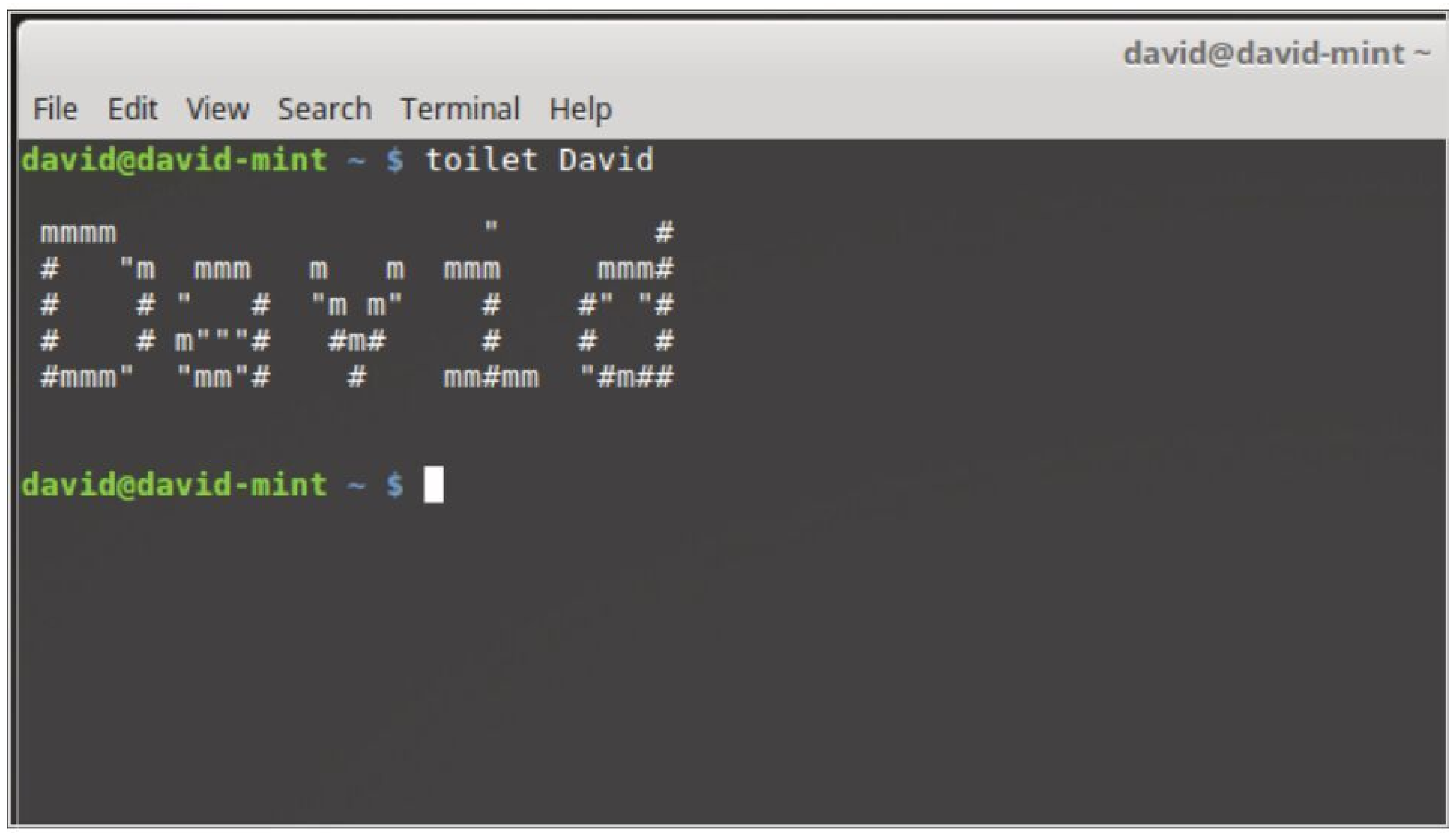
**STEP 8** If you really want to expand the whole cow thing, for whatever reason, then pipe the fortune command through it, with: `fortune | cowsay`; and for the graphical cow equivalent: `fortune | xcowsay`. Plus, there's always cowthink. Try: `cowthink ...This book is awesome`.



```
david@david-Mint:~$ fortune | xcowsay
```

You shall judge of a man by his foes as well as by his friends.
-- Joseph Conrad

**STEP 9** The command `toilet` doesn't inspire much confidence, we'll admit. However, it's not as bad as it first sounds. Start by installing it with: `sudo apt-get install toilet`. Then when installed, type something along the lines of: `toilet David`. Or perhaps list the contents of the current folder through it, with: `ls | toilet`.

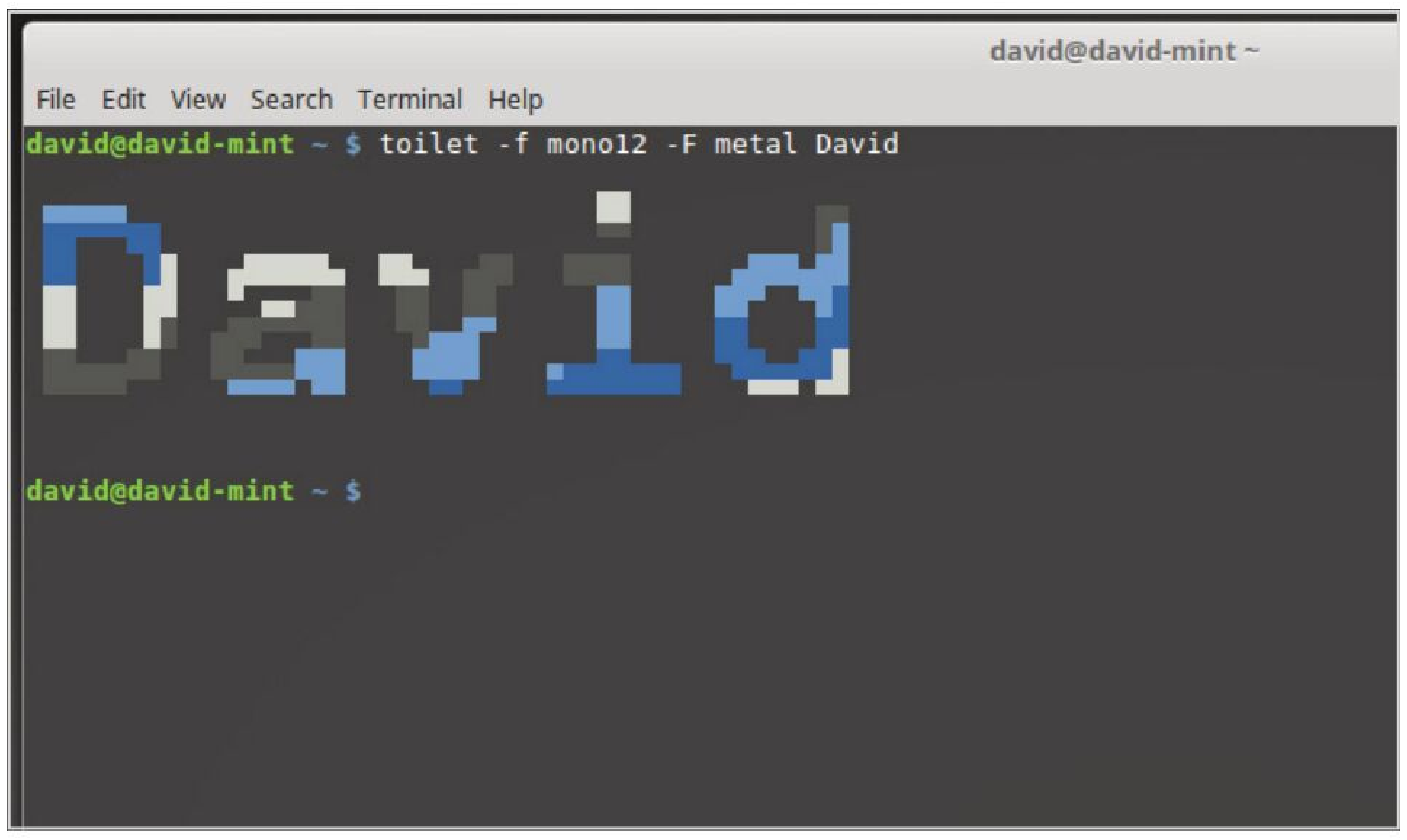


```
david@david-mint ~ $ toilet David

 mmmm                       "        #
 #   "m  mmm   m    m  mmm        mmm#
 #    # "   #  "m m"     #      #" "#
 #    # m"""#   #m#      #      #   #
 #mmm"  "mm"#    #     mm#mm   "#m##


david@david-mint ~ $ 
```

**STEP 10** Expanding the toilet command, you can actually generate some decent looking graphics through it. For example, try this: `toilet -f mono12 -F metal David`. You can enter `toilet --help`, for a list of the command line arguments to expand further.



```
david@david-mint ~ $ toilet -f mono12 -F metal David
```

```
david@david-mint ~ $
```

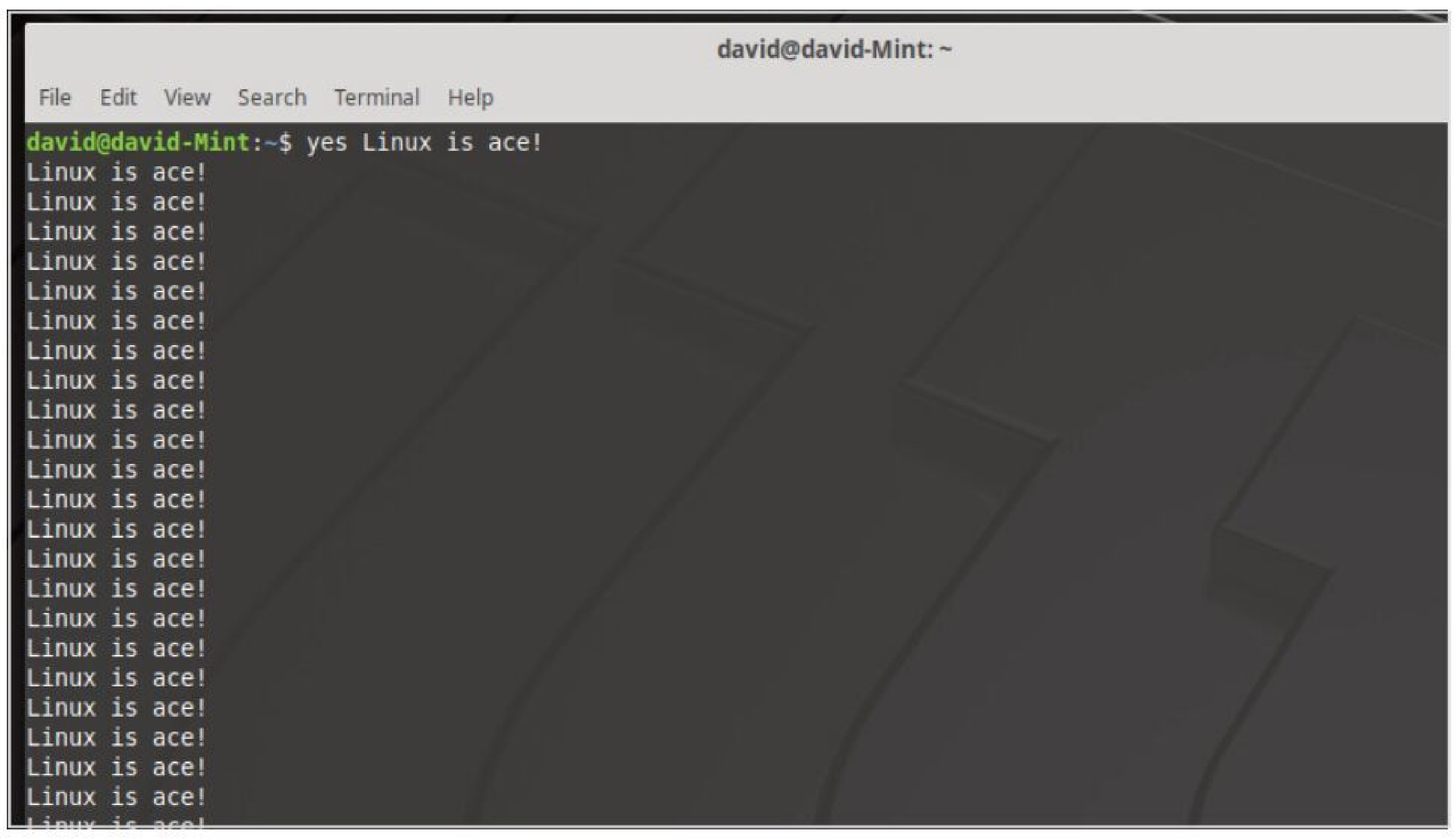
# More Fun Things to do in the Terminal

**If the previous list of fun, and quite bizarre, things to do in the Terminal has you wanting more, you're in luck. We've put together another batch of some useful, and some not so useful, commands for you to try out.**

## MORE FUN, YAY

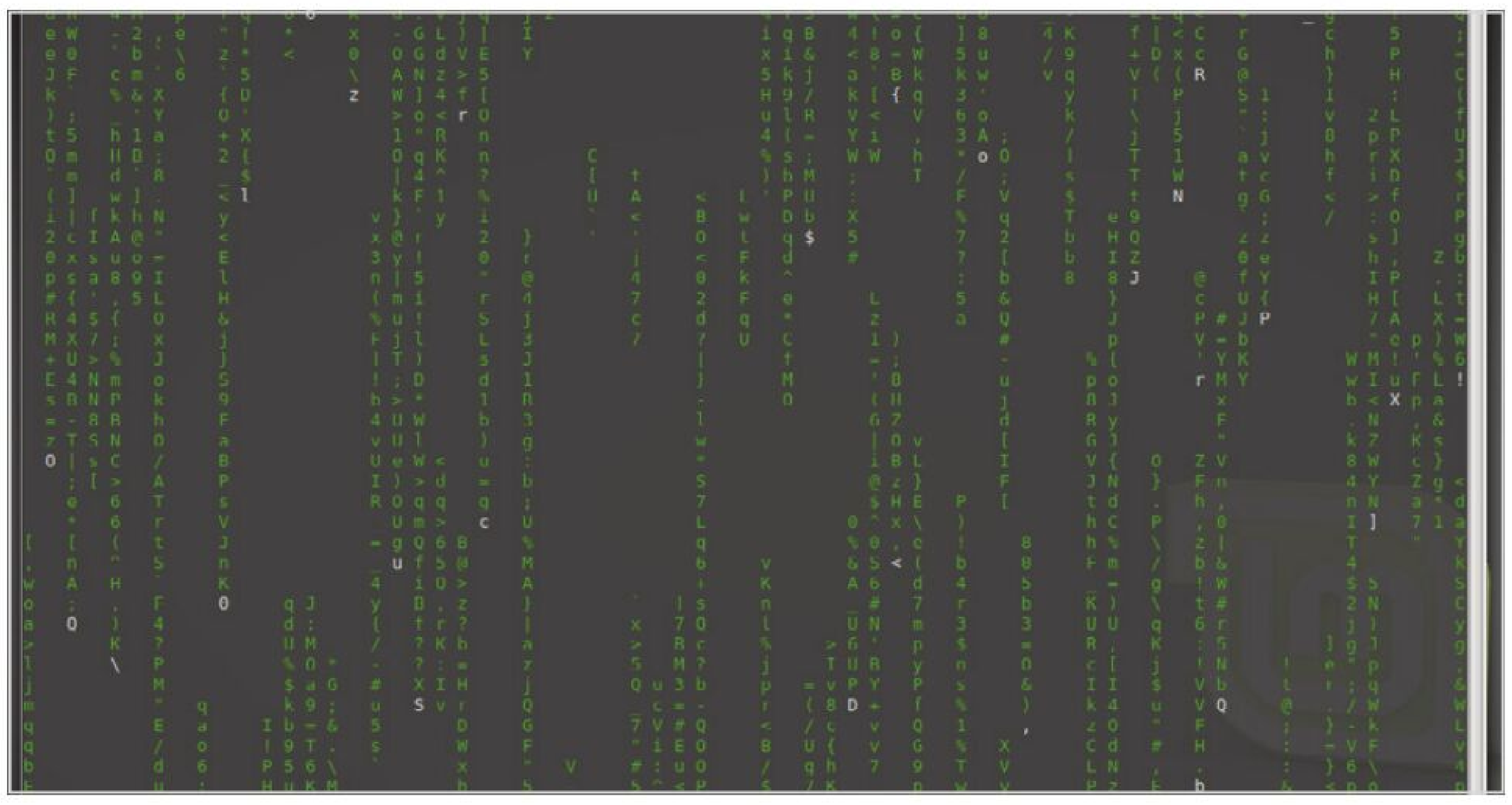
**Since the Terminal session is already open, and your keyboard digits are nicely warmed up, here are another two pages of Terminal nonsense.**

**STEP 1** Remember the old ZX Spectrum days of computing, when you could type in 10 print "Hello", 20 goto 10 and Hello would list down the screen? Well, in Linux Mint you can do the same. Simply enter `yes` followed by some text, i.e. `yes Linux is ace`. It'll keep going until you press Ctrl+C.

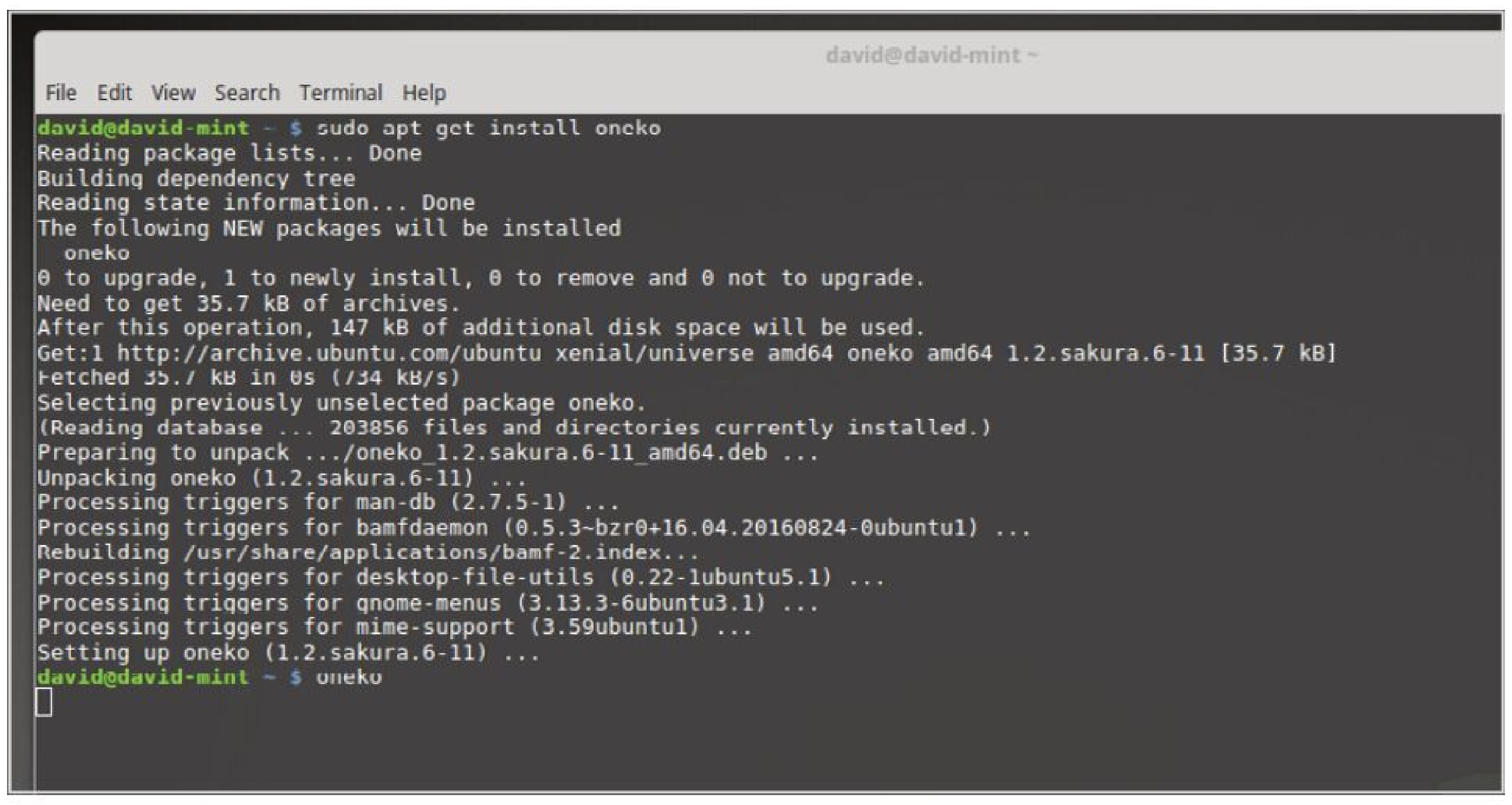


```
david@david-Mint:~$ yes Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
Linux is ace!
```

**STEP 2** The Matrix was one of the most graphically copied films ever released; there's even a version of the Matrix code available for Linux Mint. Install it with: `sudo apt-get install cmatrix`. When it's done enter: `cmatrix` and follow the white rabbit, Neo. Unlike the real Matrix though, you can press `Ctrl+C` to exit.

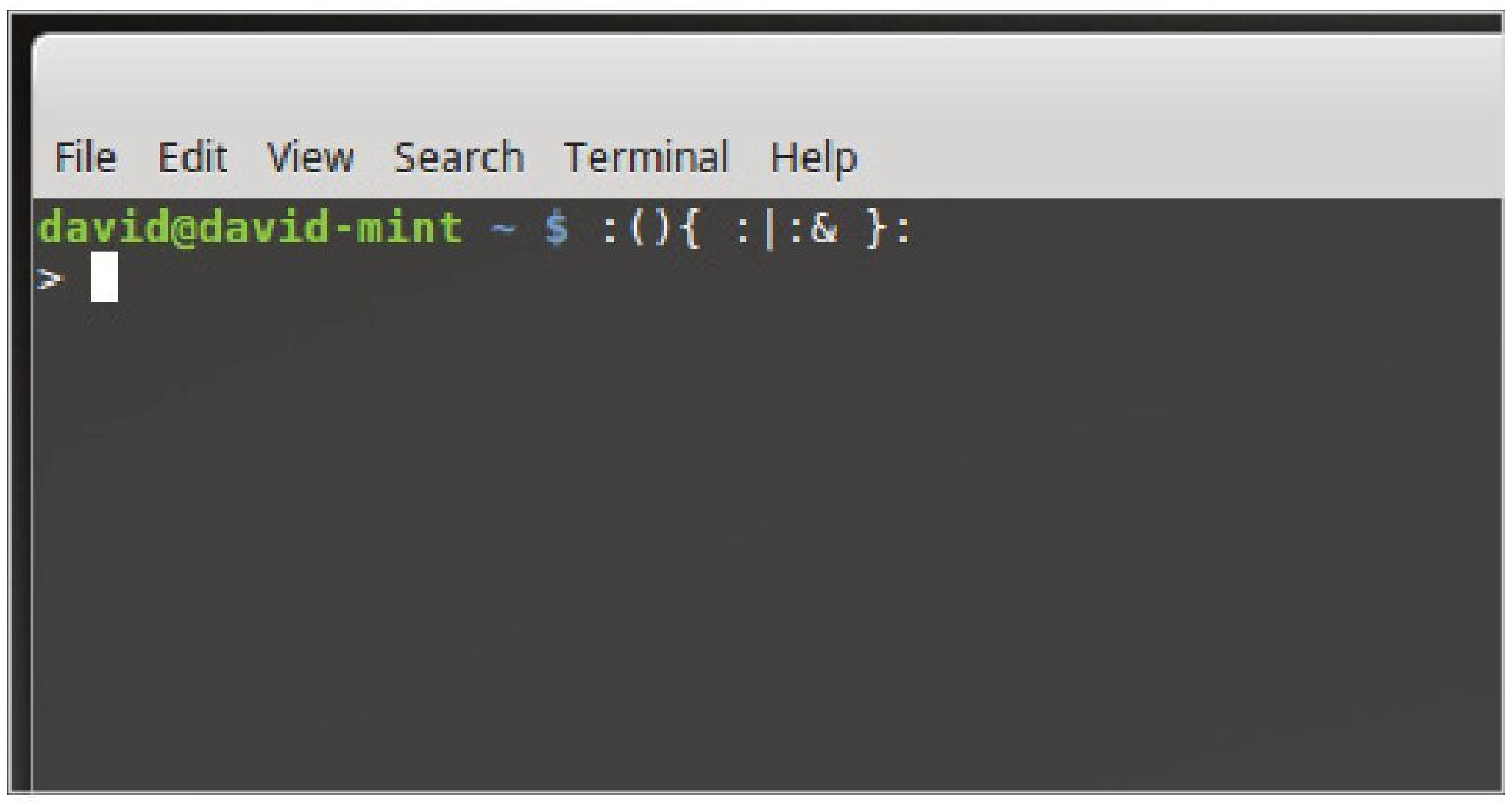


**STEP 3** Having a little white cat chase your mouse pointer around the desktop may sound like a terrible waste of time. Oddly though, it isn't. Enter: `sudo apt-get install oneko`, then type `oneko` to have the cat appear. Move your 'mouse' cursor around the screen and the cat will chase it. Use `Ctrl+C` to exit the action.



```
david@david-mint ~ $ sudo apt get install oneko
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed
  oneko
0 to upgrade, 1 to newly install, 0 to remove and 0 not to upgrade.
Need to get 35.7 kB of archives.
After this operation, 147 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu xenial/universe amd64 oneko amd64 1.2.sakura.6-11 [35.7 kB]
Fetched 35.7 kB in 0s (734 kB/s)
Selecting previously unselected package oneko.
(Reading database ... 203856 files and directories currently installed.)
Preparing to unpack .../oneko_1.2.sakura.6-11_amd64.deb ...
Unpacking oneko (1.2.sakura.6-11) ...
Processing triggers for man-db (2.7.5-1) ...
Processing triggers for bamfdaemon (0.5.3~bzr0+16.04.20160824-0ubuntu1) ...
Rebuilding /usr/share/applications/bamf-2.index...
Processing triggers for desktop-file-utils (0.22-1ubuntu5.1) ...
Processing triggers for gnome-menus (3.13.3-6ubuntu3.1) ...
Processing triggers for mime-support (3.59ubuntu1) ...
Setting up oneko (1.2.sakura.6-11) ...
david@david-mint ~ $ oneko
```

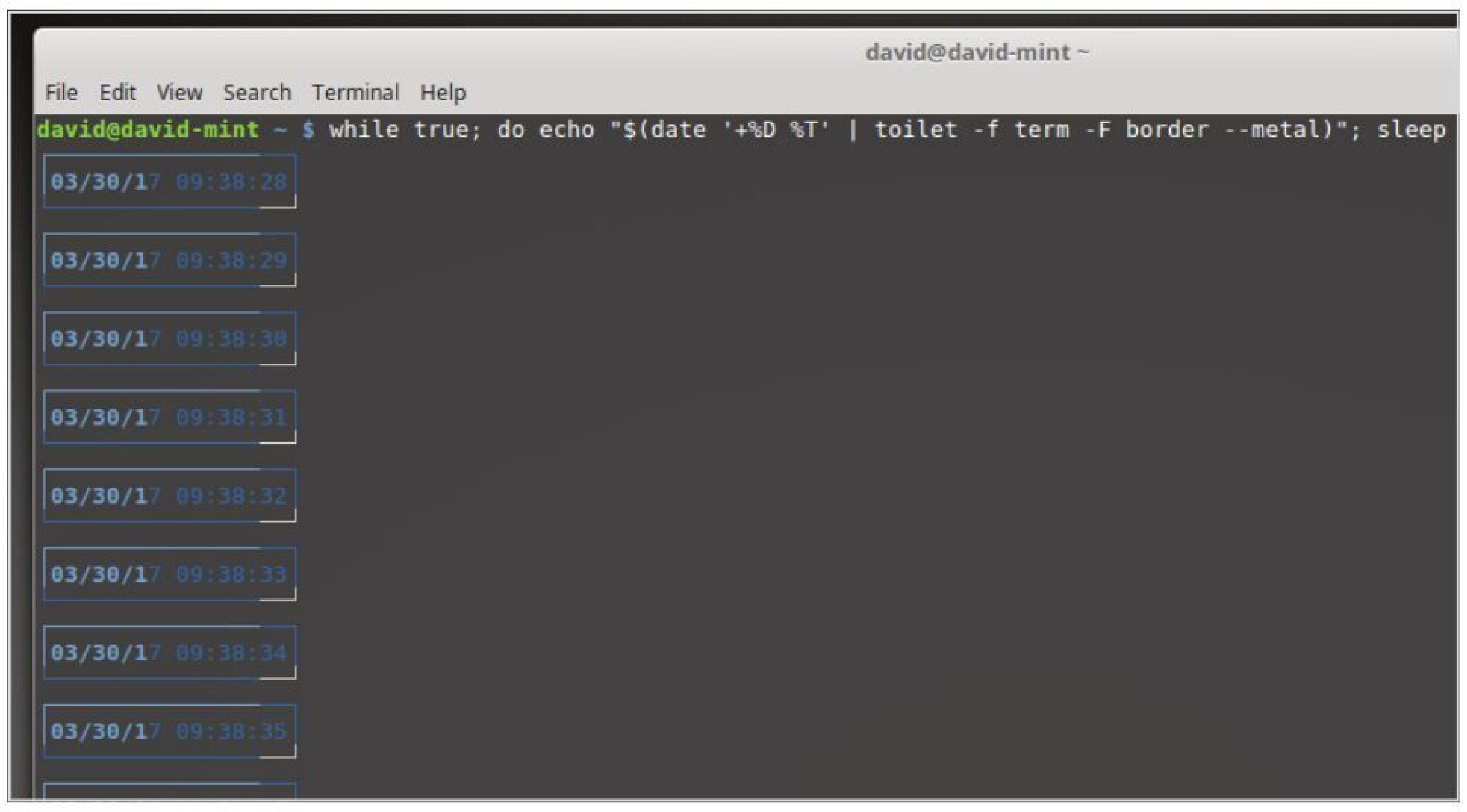
**STEP 4** This entry is a little more serious than the previous. It's called the **Fork Bomb** and what it does, basically, is continually replicate itself until it has used up all the available system resources, thus causing your computer to crash. You don't have to try it but it's interesting nonetheless. Simply enter `:(){ :|:& }:` and be prepared to reboot.



```
david@david-mint ~ $ :(){ :|:& }:
>
```

## STEP 5

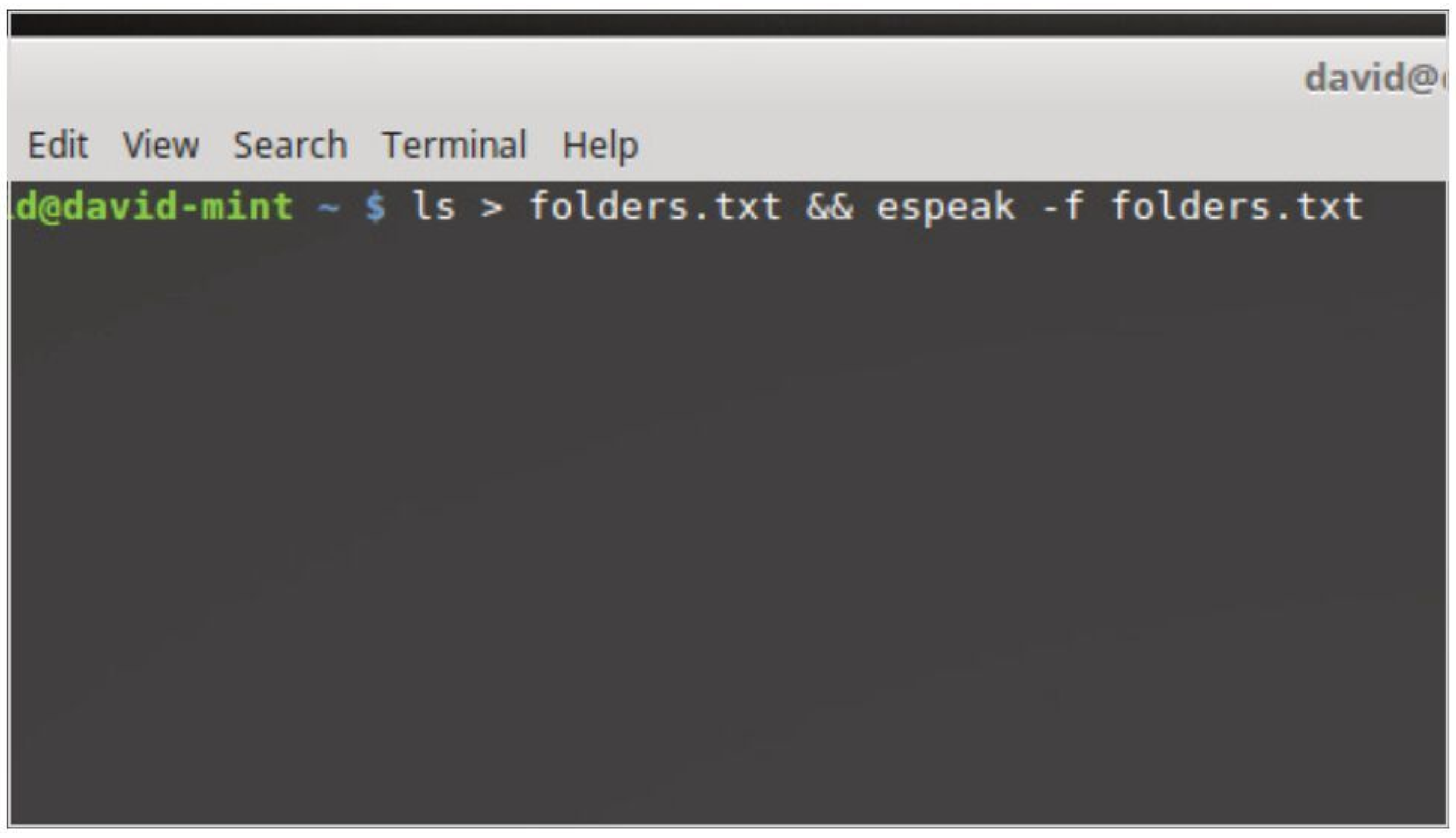
Stringing several commands and piping them through other commands is what makes scripting such a powerful element to an OS. Using the while command, for example, together with toilet, can yield some impressive results. Enter: `while true; do echo “$(date ‘+%D %T’ | toilet -f term -F border --metal)”; sleep 1; done`.



```
david@david-mint ~ $ while true; do echo "$(date '+%D %T' | toilet -f term -F border --metal)"; sleep
 03/30/17 09:38:28 
 03/30/17 09:38:29 
 03/30/17 09:38:30 
 03/30/17 09:38:31 
 03/30/17 09:38:32 
 03/30/17 09:38:33 
 03/30/17 09:38:34 
 03/30/17 09:38:35 
```

## STEP 6

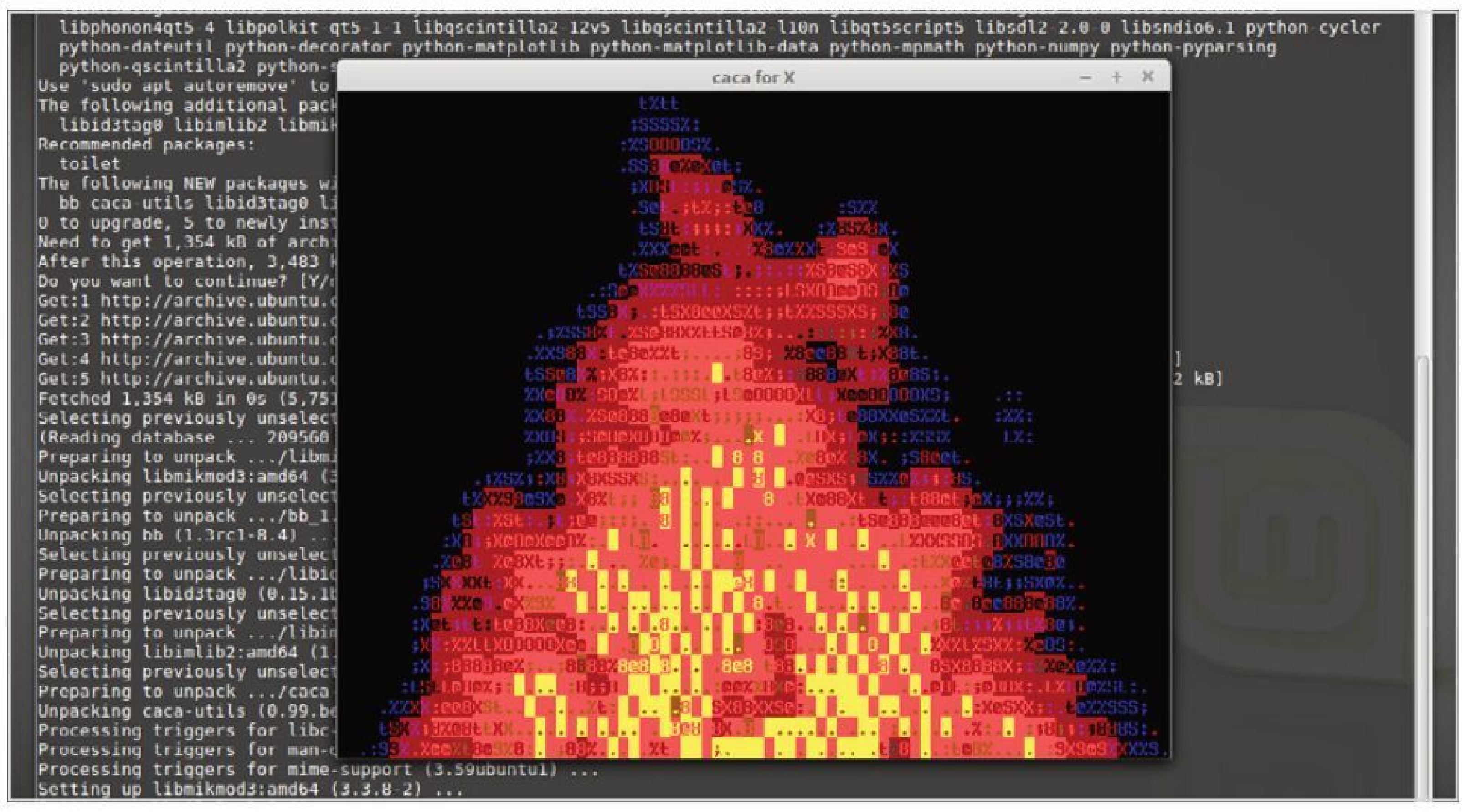
Talking computers were the craze of the 80s, enter: `espeak “Hello, this is Linux Mint”` to have the computer repeat the text inside the quotes to you. Make sure your volume is turned up, and try the following: `ls > folders.txt && espeak -f folders.txt`. This will have Mint read back the contents of the ls command.



```
d@david-mint ~ $ ls > folders.txt && espeak -f folders.txt
```

## STEP 7

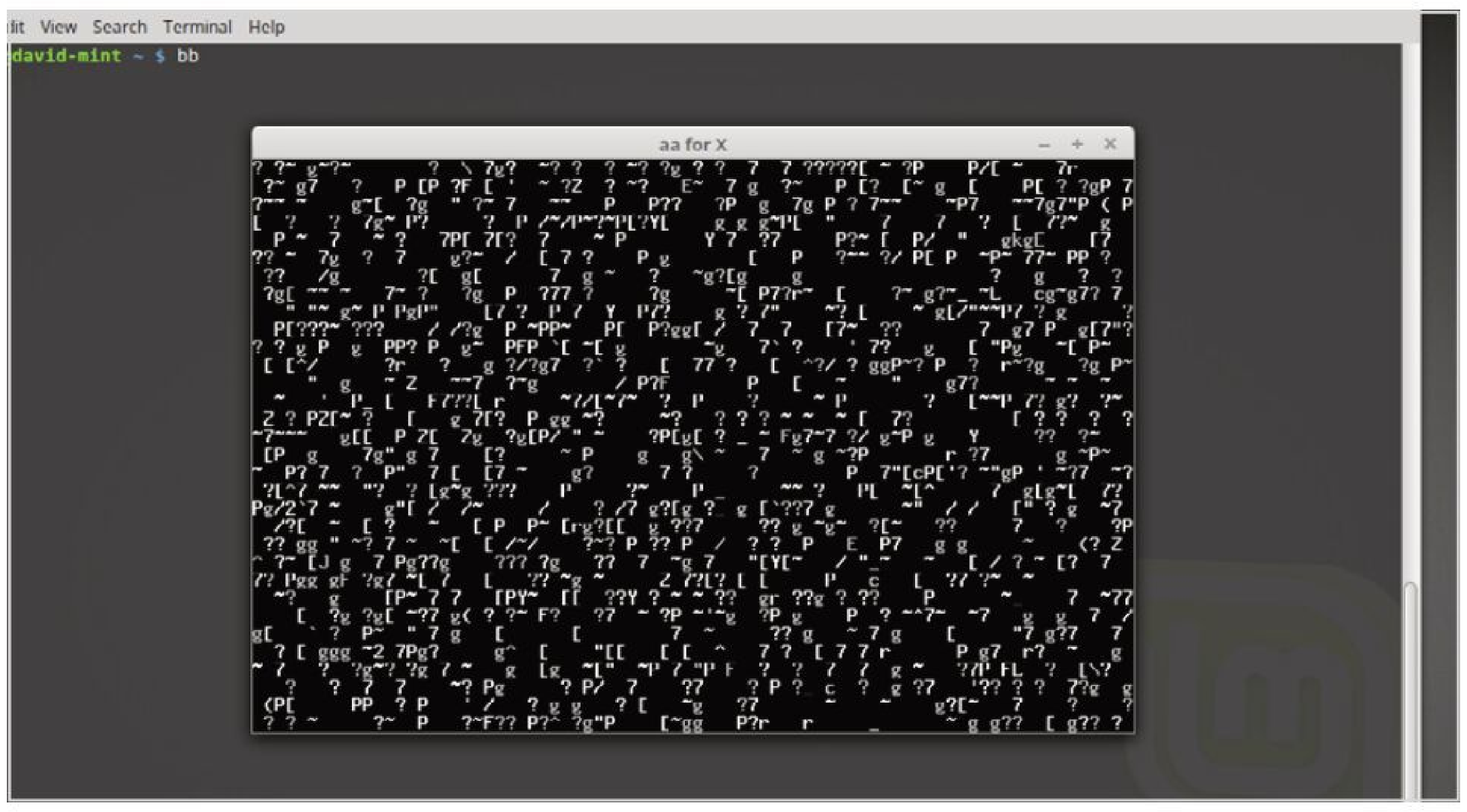
A roaring ASCII fire isn’t the most useful command to have at your disposal, but it’s fun. Install it with: `sudo apt-get install libaa-bin`, then when installed use: `aafire`. It’s not exactly warming but you get the idea. To expand the above, enter: `sudo apt-get install bb caca-utils`, then, `cacafire`.



```
  libphonon4qt5-4 libpolkit-qt5-1-1 libqscintilla2-12v5 libqscintilla2-l10n libqt5script5 libsdl2-2.0-0 libsndio6.1 python-cycler
  python-dateutil python-decorator python-matplotlib python-matplotlib-data python-mpmath python-numpy python-pyparsing
  python-qscintilla2 python-s
Use 'sudo apt autoremove' to
The following additional pack
  libid3tag0 libimlib2 libmi
Recommended packages:
  toilet
The following NEW packages wi
  bb caca-utils libid3tag0 li
0 to upgrade, 5 to newly inst
Need to get 1,354 kB of archi
After this operation, 3,483 k
Do you want to continue? [Y/n
Get:1 http://archive.ubuntu.c
Get:2 http://archive.ubuntu.c
Get:3 http://archive.ubuntu.c
Get:4 http://archive.ubuntu.c
Get:5 http://archive.ubuntu.c
Fetched 1,354 kB in 0s (5,751
Selecting previously unselect
(Reading database ... 209560
Preparing to unpack .../libmi
Unpacking libmikmod3:amd64 (3
Selecting previously unselect
Preparing to unpack .../bb_1.
Unpacking bb (1.3rc1-8.4) ...
Selecting previously unselect
Preparing to unpack .../libic
Unpacking libid3tag0 (0.15.1b
Selecting previously unselect
Preparing to unpack .../libim
Unpacking libimlib2:amd64 (1.
Selecting previously unselect
Preparing to unpack .../caca
Unpacking caca-utils (0.99.be
Processing triggers for libc-
Processing triggers for man-d
Processing triggers for mime-support (3.59ubuntu1) ...
Setting up libmikmod3:amd64 (3.3.8-2) ...
```

## STEP 8

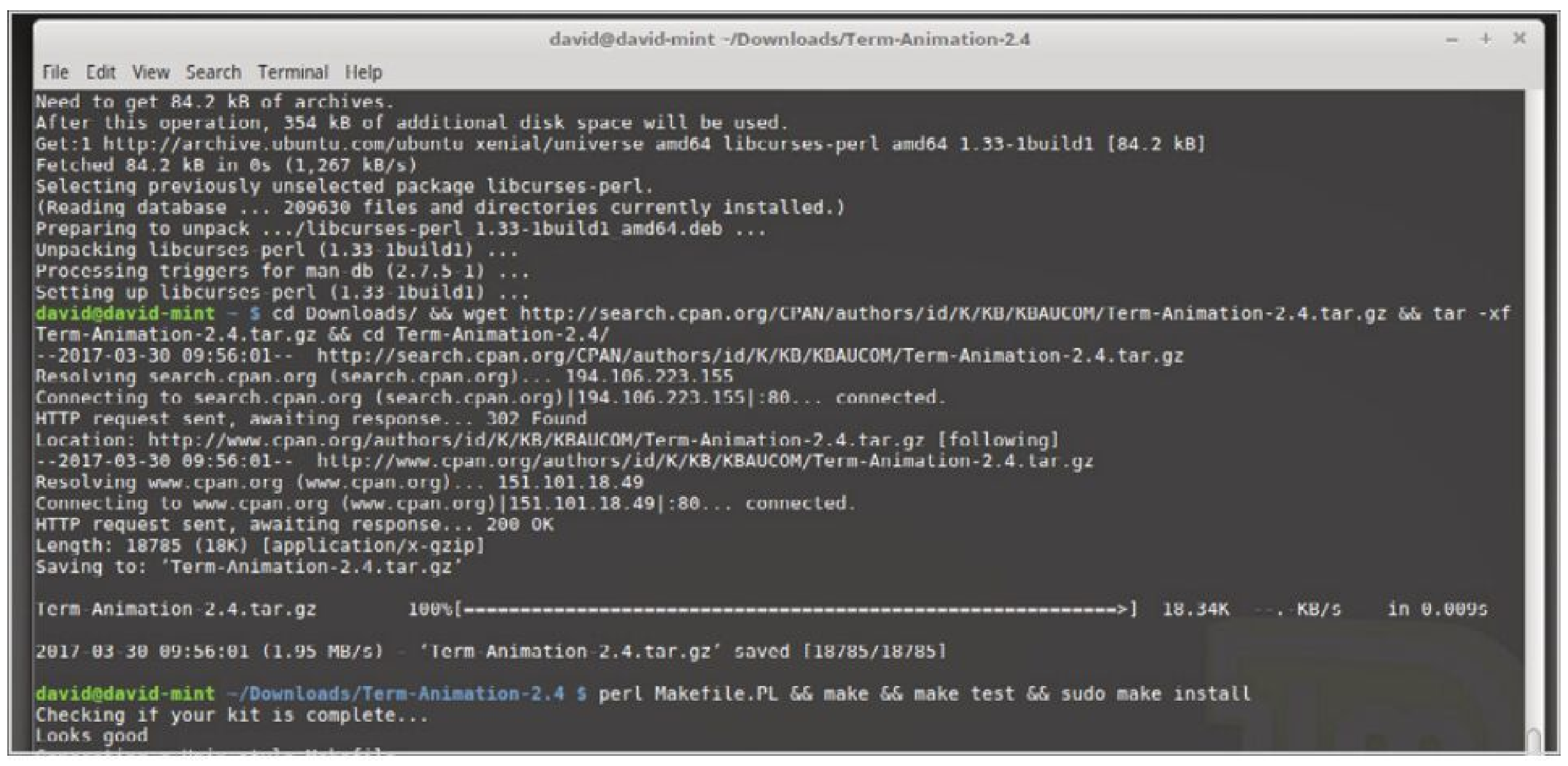
Used as a music demo from the old Amiga and DOS days, the **bb** command reminds us of getting hold of three and a half inch floppies crammed with all manner of demoscene goodies. We’ve already installed bb from the previous step, so just enter **bb**. Follow the on-screen instructions, and turn up your volume.



```
david-mint ~ $ bb
```

## STEP 9

This entry is in two parts. First you need to get hold of the necessary packages: `sudo apt-get install libcurses-perl`. When that’s done enter: `cd Downloads/ && wget http://search.cpan.org/CPAN/authors/id/K/KB/KBAUCOM/Term-Animation-2.4.tar.gz && tar -xf Term-Animation-2.4.tar.gz && cd Term-Animation-2.4/`. Then: `perl Makefile.PL && make && make test && sudo make install`.


david@david-mint ~/Downloads/Term-Animation-2.4
File Edit View Search Terminal Help

```
Need to get 84.2 kB of archives.
After this operation, 354 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu xenial/universe amd64 libcurses-perl amd64 1.33-1build1 [84.2 kB]
Fetched 84.2 kB in 0s (1,267 kB/s)
Selecting previously unselected package libcurses-perl.
(Reading database ... 209630 files and directories currently installed.)
Preparing to unpack .../libcurses-perl_1.33-1build1_amd64.deb ...
Unpacking libcurses-perl (1.33-1build1) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up libcurses-perl (1.33-1build1) ...
david@david-mint ~ $ cd Downloads/ && wget http://search.cpan.org/CPAN/authors/id/K/KB/KBAUCOM/Term-Animation-2.4.tar.gz && tar -xf
Term-Animation-2.4.tar.gz && cd Term-Animation-2.4/
--2017-03-30 09:56:01--  http://search.cpan.org/CPAN/authors/id/K/KB/KBAUCOM/Term-Animation-2.4.tar.gz
Resolving search.cpan.org (search.cpan.org)... 194.106.223.155
Connecting to search.cpan.org (search.cpan.org)|194.106.223.155|:80... connected.
HTTP request sent, awaiting response... 302 Found
Location: http://www.cpan.org/authors/id/K/KB/KBAUCOM/Term-Animation-2.4.tar.gz [following]
--2017-03-30 09:56:01--  http://www.cpan.org/authors/id/K/KB/KBAUCOM/Term-Animation-2.4.tar.gz
Resolving www.cpan.org (www.cpan.org)... 151.101.18.49
Connecting to www.cpan.org (www.cpan.org)|151.101.18.49|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 18785 (18K) [application/x-gzip]
Saving to: ‘Term-Animation-2.4.tar.gz’

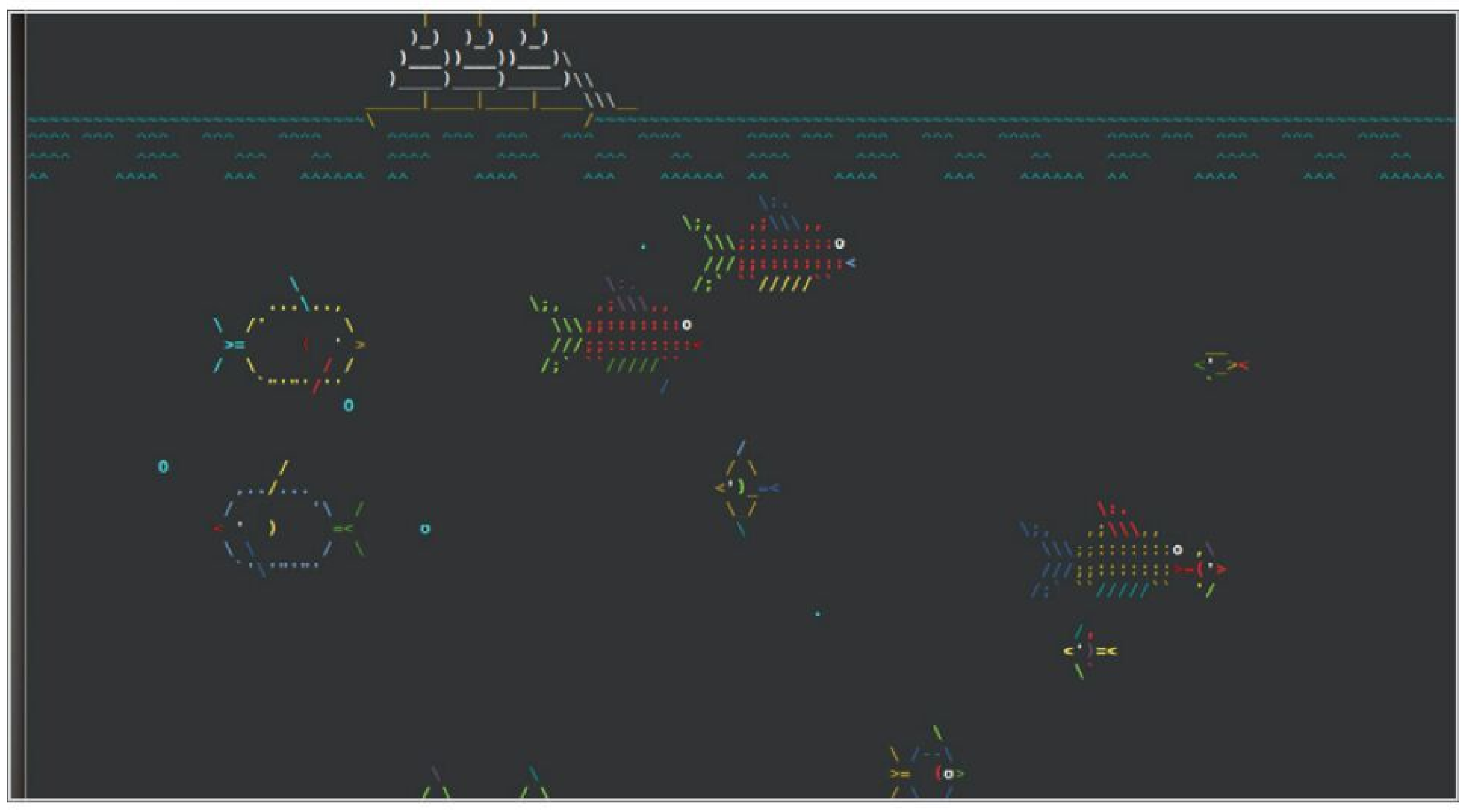
Term-Animation-2.4.tar.gz       100%[=====================================================>]  18.34K  --.-KB/s    in 0.009s

2017-03-30 09:56:01 (1.95 MB/s) - ‘Term-Animation-2.4.tar.gz’ saved [18785/18785]

david@david-mint ~/Downloads/Term-Animation-2.4 $ perl Makefile.PL && make && make test && sudo make install
Checking if your kit is complete...
Looks good
```

## STEP 10

With that little lot done, onto the next. Enter: `cd .. && wget http://www.robobunny.com/projects/asciiquarium/asciiquarium.tar.gz && tar -xf asciiquarium.tar.gz && cd asciiquarium_1.1/ && chmod +x asciiquarium`. Providing all went well, enter `./asciiquarium` and enjoy your very own ASCII-based aquarium.



# Linux Tips and Tricks

As you've seen, the Linux Terminal is quite an exceptional environment. With a few extra apps installed, and a smidgen of command knowledge, incredible, and often quite strange, things can be accomplished.

## TAKING COMMAND

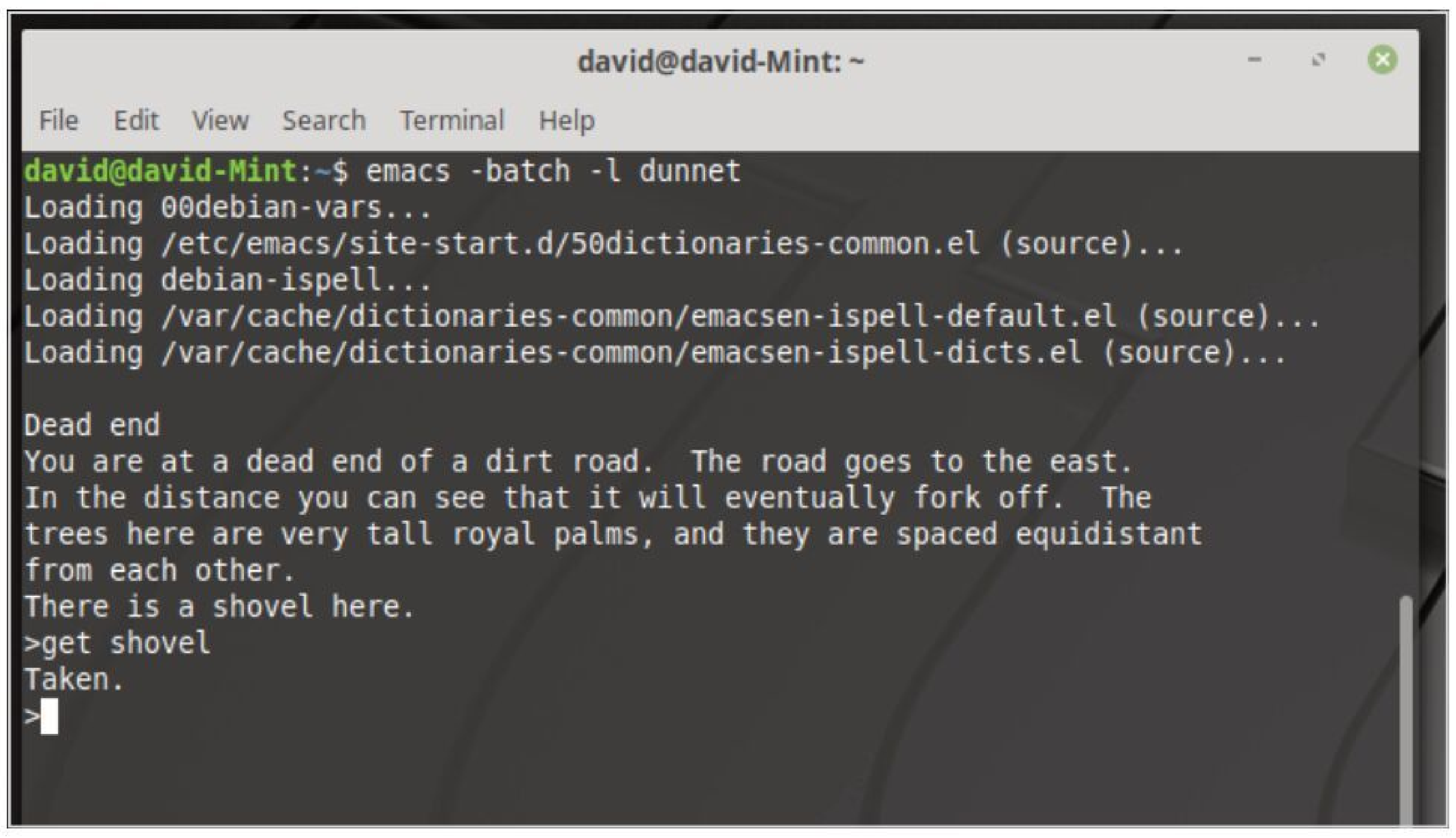
**There are countless Linux tips, secrets, hacks and tricks out there. Some are very old, originating from Linux's Unix heritage, while others are recent additions to Linux lore. Here's our favourite ten tips and tricks.**

### EASTER EGGS

Emacs, the text editor, is a great piece of software, however, did you know it also contains a hidden Easter Egg? With Emacs installed (**sudo apt-get install emacs25**), drop to a Terminal session and enter:

```
emacs -batch -l dunnet
```

Dunnet is a text adventure written by Ron Schnell in 1982, and hidden in Emacs since 1994.



```
david@david-Mint:~$ emacs -batch -l dunnet
Loading 00debian-vars...
Loading /etc/emacs/site-start.d/50dictionaries-common.el (source)...
Loading debian-ispell...
Loading /var/cache/dictionaries-common/emacsen-ispell-default.el (source)...
Loading /var/cache/dictionaries-common/emacsen-ispell-dicts.el (source)...

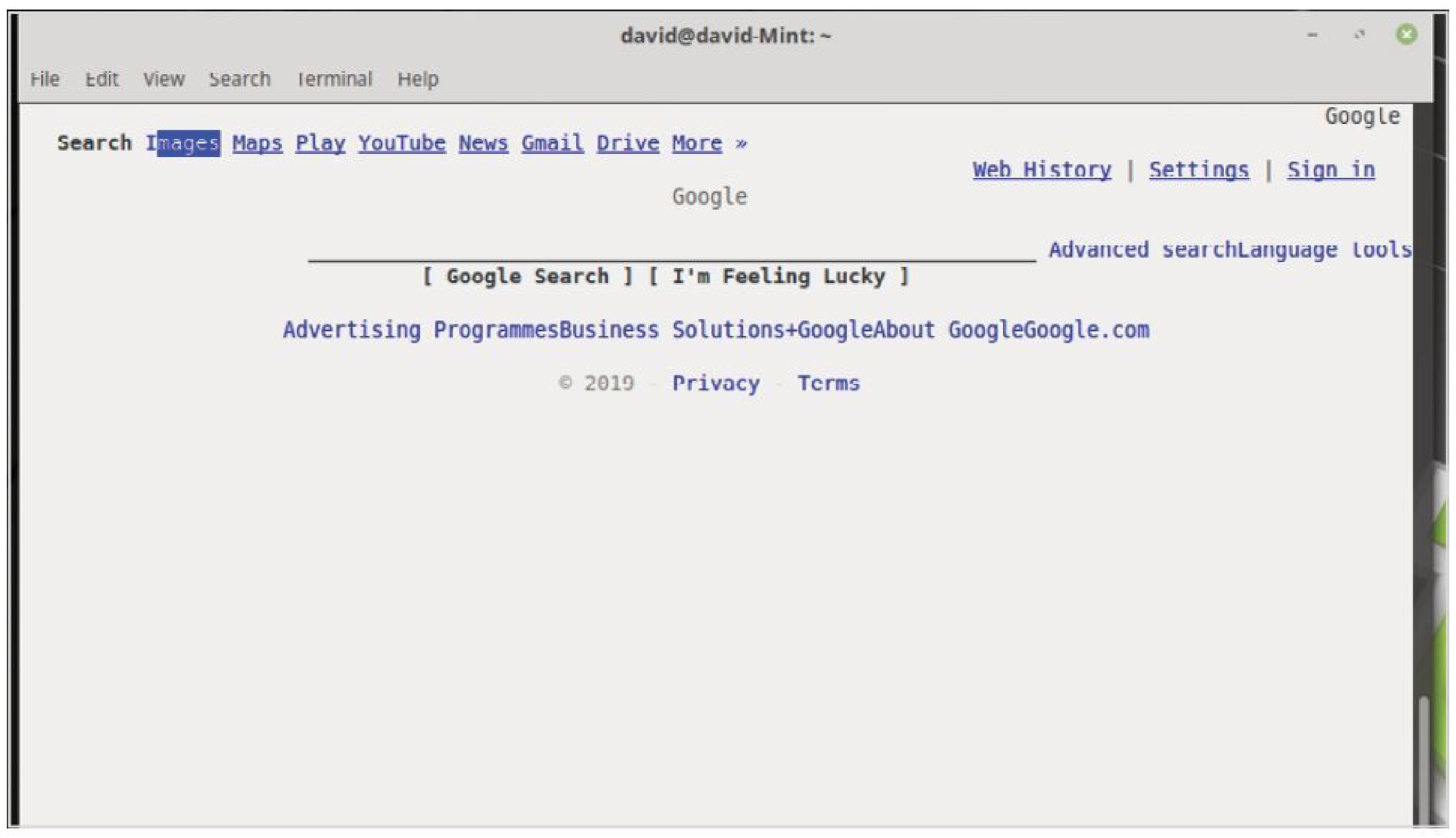
Dead end
You are at a dead end of a dirt road.  The road goes to the east.
In the distance you can see that it will eventually fork off.  The
trees here are very tall royal palms, and they are spaced equidistant
from each other.
There is a shovel here.
>get shovel
Taken.
>
```

### TERMINAL BROWSING

Ever fancied being able to browse the Internet from the Terminal? While not particularly useful, it is quite a fascinating thing to behold. To do so, enter:

```
sudo apt-get install elinks
elinks
```

Enter the website you want to visit.



```
                                                                    Google
  Search Images Maps Play YouTube News Gmail Drive More »
                                                 Web History | Settings | Sign in
                                 Google

              ________________________________________ Advanced searchLanguage tools
                     [ Google Search ] [ I'm Feeling Lucky ]

             Advertising ProgrammesBusiness Solutions+GoogleAbout GoogleGoogle.com

                              © 2019 - Privacy - Terms
```

### MOON BUGGY

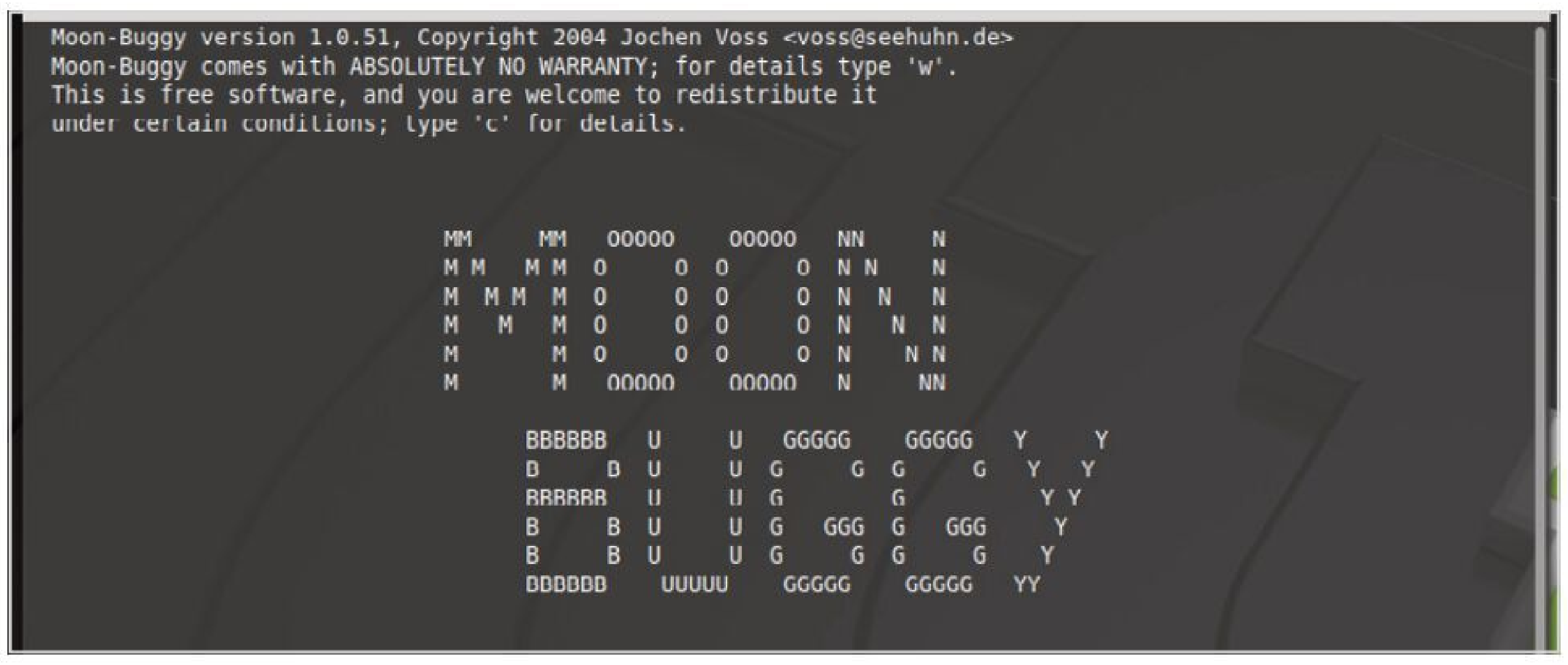
Based on the classic 1982 arcade game, Moon Patrol, Moon Buggy appeared on the home computers of 1985 amid much praise. It's a cracking Atari game, and it's available in the Linux Terminal by entering:

```
sudo apt-get install moon-buggy
```

Then:

```
moon-buggy
```

Enjoy.



```
Moon-Buggy version 1.0.51, Copyright 2004 Jochen Voss <voss@seehuhn.de>
Moon-Buggy comes with ABSOLUTELY NO WARRANTY; for details type 'w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type 'c' for details.



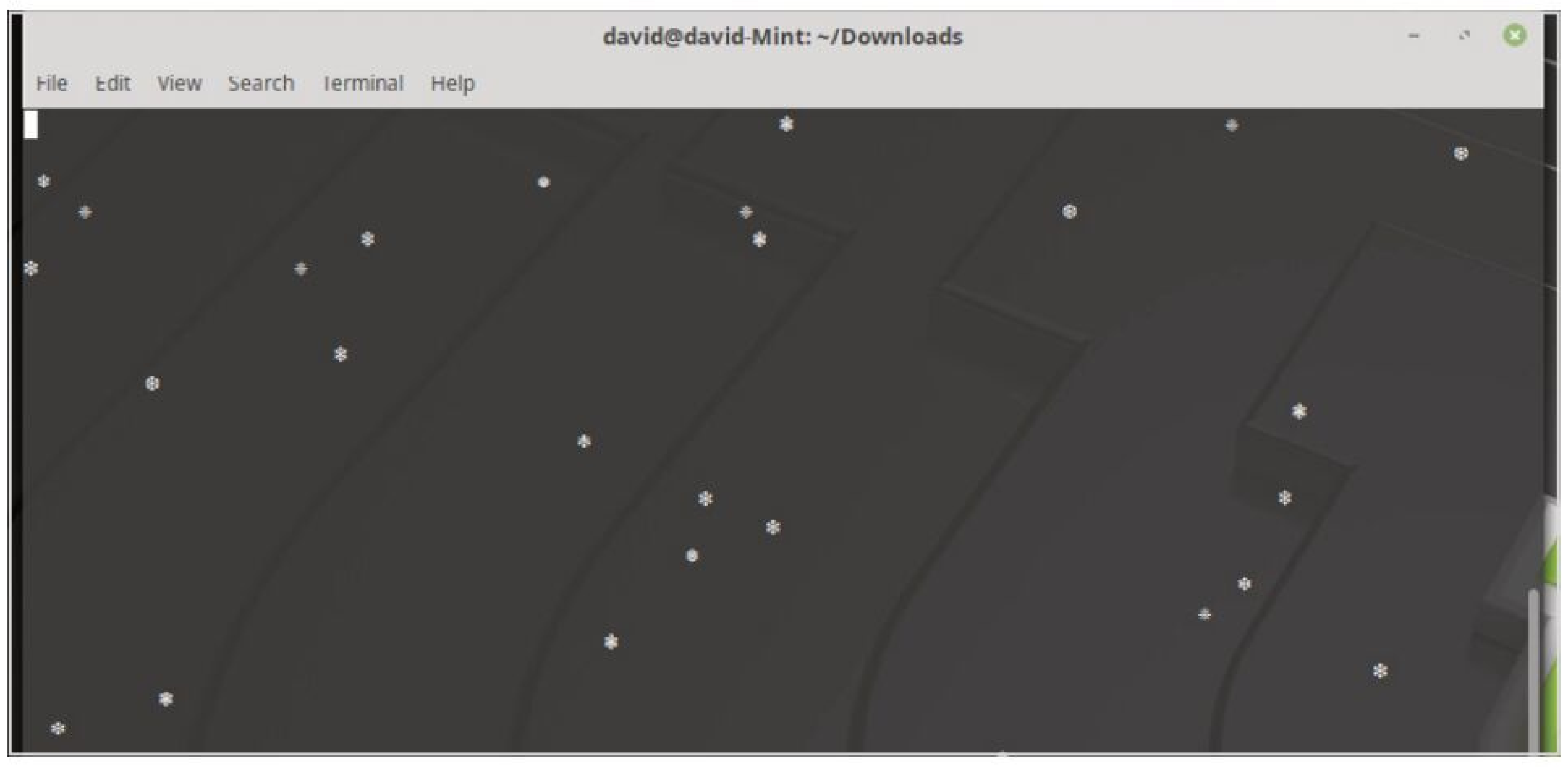
              MM     MM   OOOOO    OOOOO   NN     N
              M M   M M  O     O  O     O  N N    N
              M  M M  M  O     O  O     O  N  N   N
              M   M   M  O     O  O     O  N   N  N
              M       M  O     O  O     O  N    N N
              M       M   OOOOO    OOOOO   N     NN

                    BBBBBB  U     U  GGGGG    GGGGG   Y     Y
                    B     B U     U G     G  G     G   Y   Y
                    BBBBBB  U     U G        G          Y Y
                    B     B U     U G   GGG  G   GGG     Y
                    B     B U     U G     G  G     G    Y
                    BBBBBB   UUUUU   GGGGG    GGGGG   YY
```

### LET IT SNOW

Snowing in the Terminal console isn't something you come across every day. If you're interested, however, enter:

```
wget https://gist.githubusercontent com/sontek/
        1505483/raw/7d024716ea57e69fb52632fee09f42
        753361c4a2/snowjob.sh
chmod +x snowjob.sh
./snowjob.sh
```



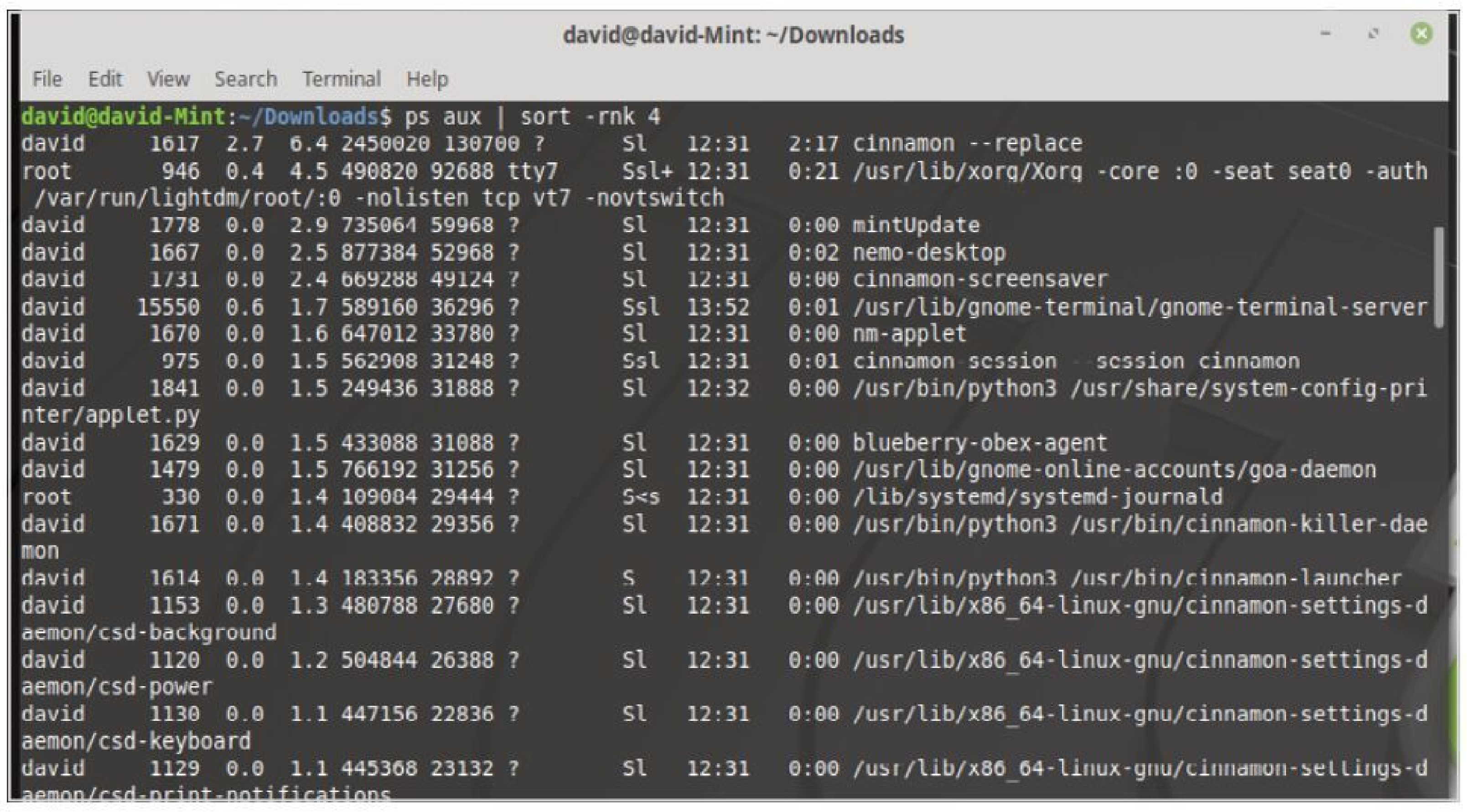
david@david-Mint: ~/Downloads
File Edit View Search Terminal Help

## MEMORY HOGS

If you need to see what apps are consuming the most memory on Linux, simply enter:

```
ps aux | sort -rnk 4
```

This sorts the output by system memory use.



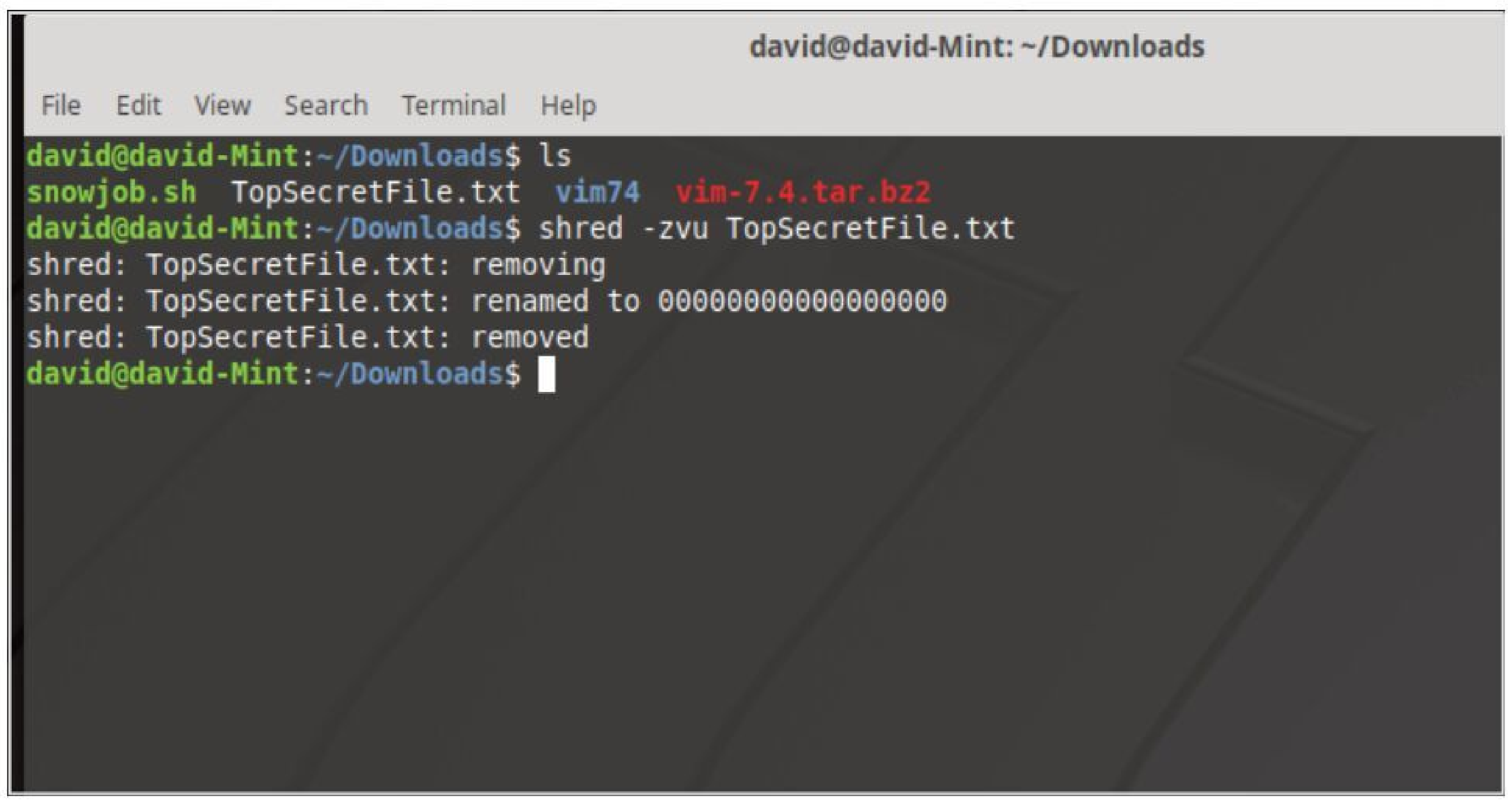
```
david@david-Mint: ~/Downloads
david@david-Mint:~/Downloads$ ps aux | sort -rnk 4
david     1617  2.7  6.4 2450020 130700 ?      Sl   12:31   2:17 cinnamon --replace
root       946  0.4  4.5 490820 92688 tty7     Ssl+ 12:31   0:21 /usr/lib/xorg/Xorg -core :0 -seat seat0 -auth
 /var/run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch
david     1778  0.0  2.9 735064 59968 ?        Sl   12:31   0:00 mintUpdate
david     1667  0.0  2.5 877384 52968 ?        Sl   12:31   0:02 nemo-desktop
david     1731  0.0  2.4 669288 49124 ?        Sl   12:31   0:00 cinnamon-screensaver
david    15550  0.6  1.7 589160 36296 ?        Ssl  13:52   0:01 /usr/lib/gnome-terminal/gnome-terminal-server
david     1670  0.0  1.6 647012 33780 ?        Sl   12:31   0:00 nm-applet
david      975  0.0  1.5 562908 31248 ?        Ssl  12:31   0:01 cinnamon-session --session cinnamon
david     1841  0.0  1.5 249436 31888 ?        Sl   12:32   0:00 /usr/bin/python3 /usr/share/system-config-pri
nter/applet.py
david     1629  0.0  1.5 433088 31088 ?        Sl   12:31   0:00 blueberry-obex-agent
david     1479  0.0  1.5 766192 31256 ?        Sl   12:31   0:00 /usr/lib/gnome-online-accounts/goa-daemon
root       330  0.0  1.4 109084 29444 ?        S<s  12:31   0:00 /lib/systemd/systemd-journald
david     1671  0.0  1.4 408832 29356 ?        Sl   12:31   0:00 /usr/bin/python3 /usr/bin/cinnamon-killer-dae
mon
david     1614  0.0  1.4 183356 28892 ?        S    12:31   0:00 /usr/bin/python3 /usr/bin/cinnamon-launcher
david     1153  0.0  1.3 480788 27680 ?        Sl   12:31   0:00 /usr/lib/x86_64-linux-gnu/cinnamon-settings-d
aemon/csd-background
david     1120  0.0  1.2 504844 26388 ?        Sl   12:31   0:00 /usr/lib/x86_64-linux-gnu/cinnamon-settings-d
aemon/csd-power
david     1130  0.0  1.1 447156 22836 ?        Sl   12:31   0:00 /usr/lib/x86_64-linux-gnu/cinnamon-settings-d
aemon/csd-keyboard
david     1129  0.0  1.1 445368 23132 ?        Sl   12:31   0:00 /usr/lib/x86_64-linux-gnu/cinnamon-settings-d
aemon/csd-print-notifications
```

## SHREDDER

When you delete a file, there's a chance of someone with the right software being able to retrieve it. However, to securely and permanently delete a file, use Shred:

```
shred -zvu NAMEOFFILE.txt
```

Replace **NAMEOFFILE** with the name of the file to delete.



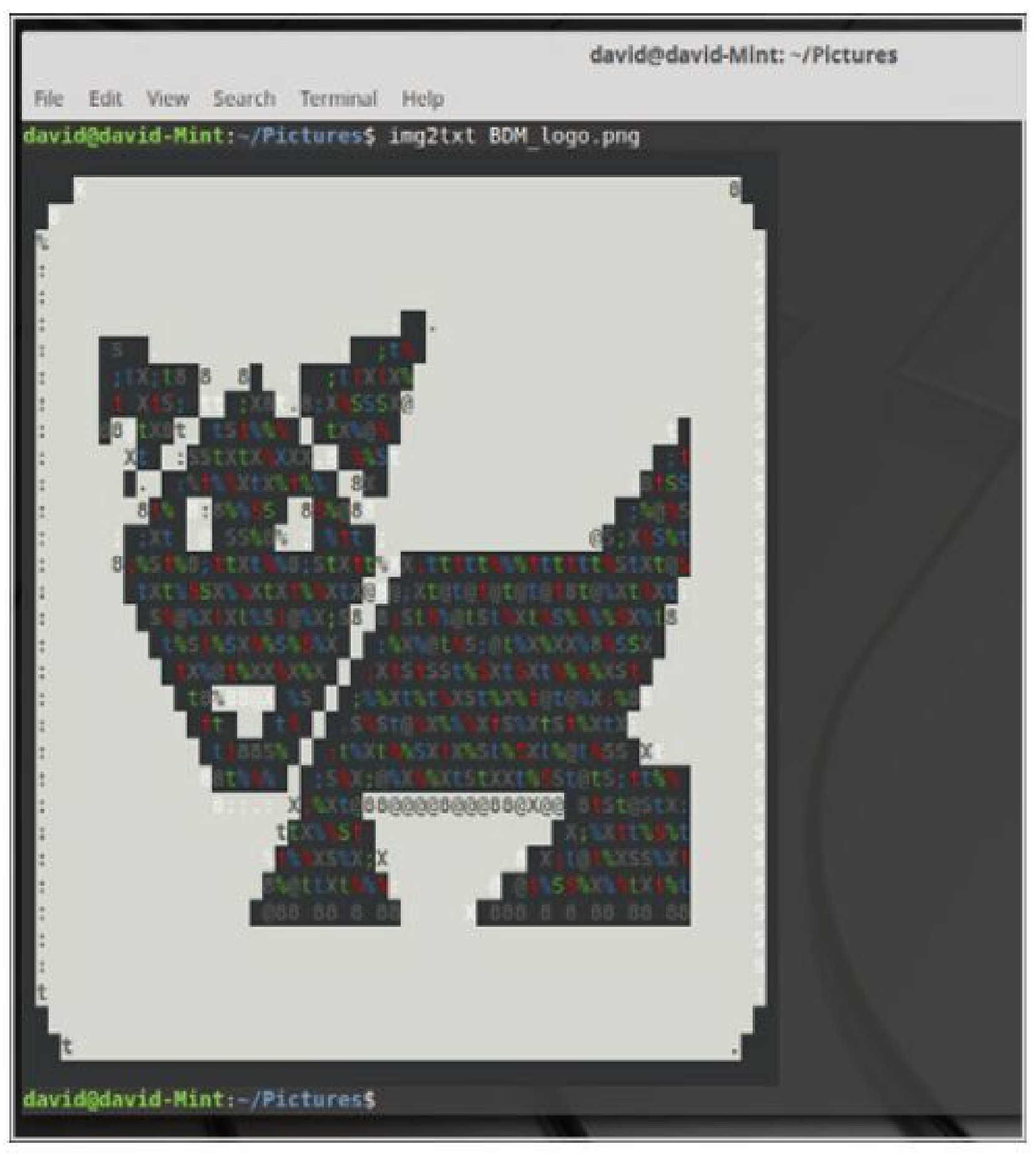
```
david@david-Mint: ~/Downloads
david@david-Mint:~/Downloads$ ls
snowjob.sh  TopSecretFile.txt  vim74  vim-7.4.tar.bz2
david@david-Mint:~/Downloads$ shred -zvu TopSecretFile.txt
shred: TopSecretFile.txt: removing
shred: TopSecretFile.txt: renamed to 00000000000000000
shred: TopSecretFile.txt: removed
david@david-Mint:~/Downloads$ 
```

## ASCII ART

ASCII art can be quite striking when applied to some images. However, it's often difficult to get just right. You can create some great ASCII art from the images you have by using img2txt:

```
img2txt NAMEOFIMAGEFILE.png
```

Replace NAMEOFIMAGEFILE with the actual name of the image file on your system. If img2txt install installed, use: `sudo apt-get install caca-utils`.



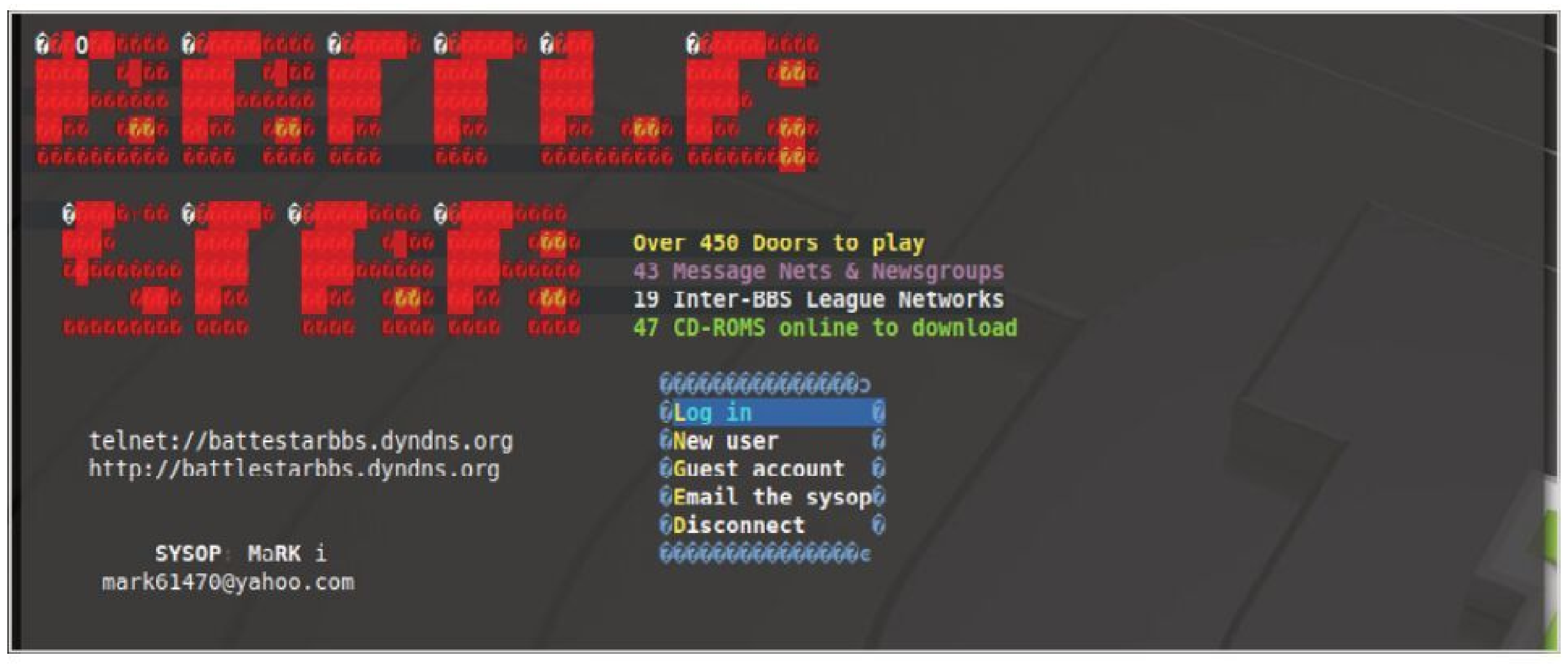
```
david@david-Mint: ~/Pictures
david@david-Mint:~/Pictures$ img2txt BDM_logo.png
david@david-Mint:~/Pictures$
```

## BBS

Back in the days of dial-up connections, the online world was made up of Bulletin Board Systems. These remote servers provided hang-outs for users to chat, swap code, play games and more. Using telnet in Linux, we can still connect to some active BBSes:

```
telnet battlestarbbs.dyndns.org
```

There are countless operational BBSes available, check out **https://www.telnetbbsguide.com/bbs/list/detail/**, for more.



```
Over 450 Doors to play
43 Message Nets & Newsgroups
19 Inter-BBS League Networks
47 CD-ROMS online to download

telnet://battestarbbs.dyndns.org
http://battlestarbbs.dyndns.org

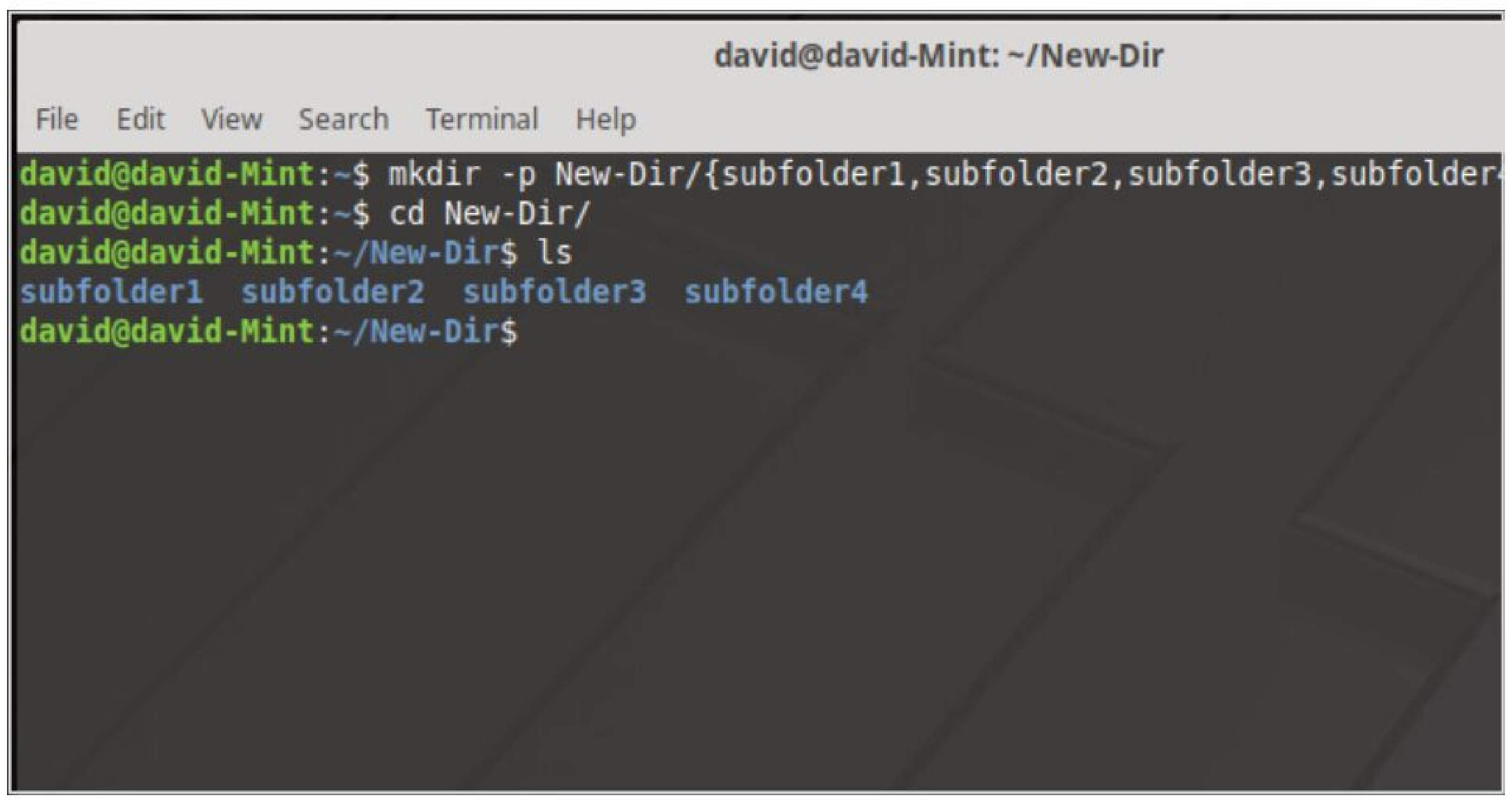
SYSOP: MaRK i
mark61470@yahoo.com
```

## DIRECTORY TREES

If you want to create an entire directory (or folder) tree with a single command, you can use:

```
mkdir -p New-Dir/
{subfolder1,subfolder2,subfolder3,subfolder4}
```

This creates a New-Dir with four sub folders within.

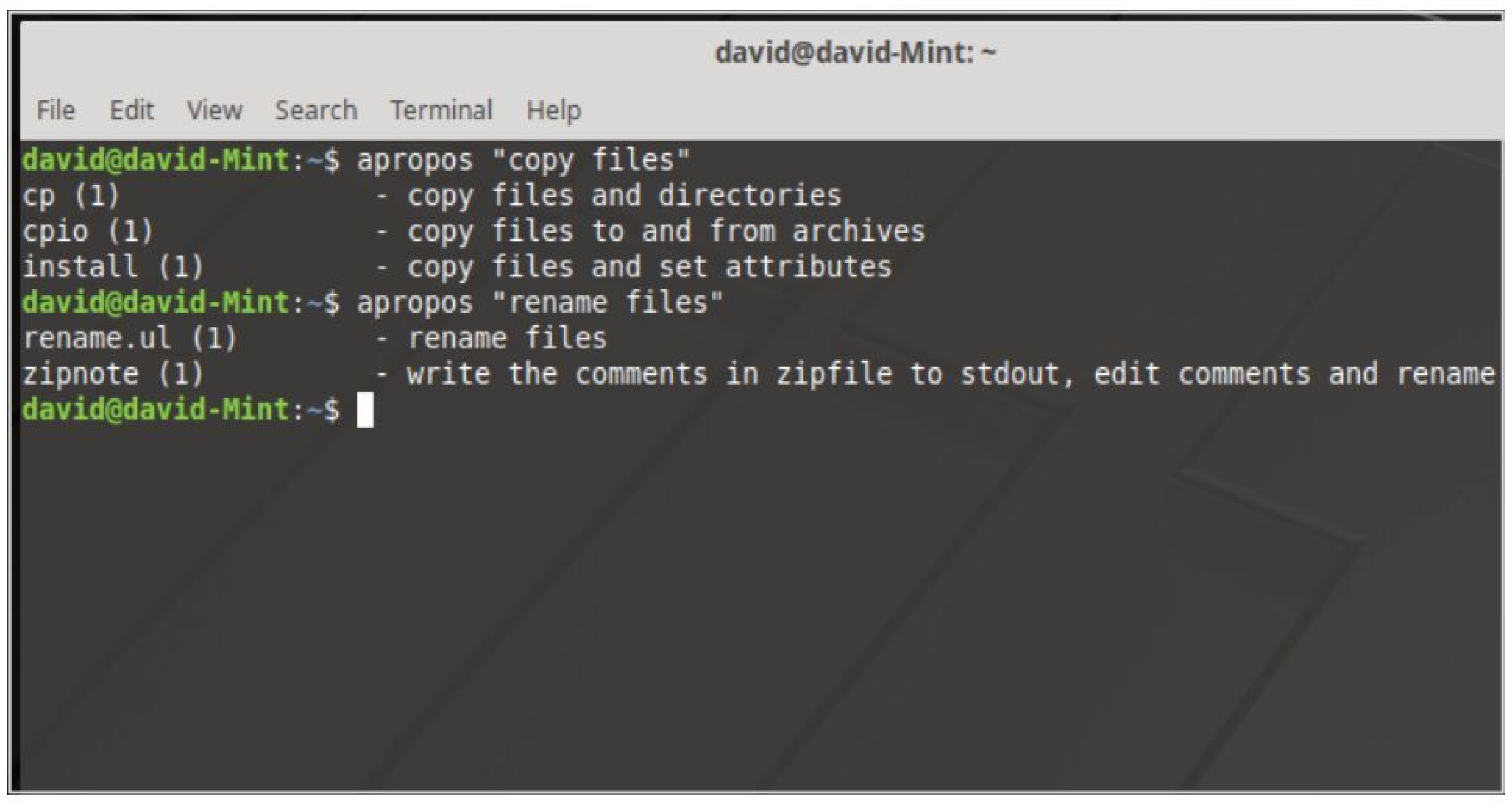


```
david@david-Mint: ~/New-Dir
david@david-Mint:~$ mkdir -p New-Dir/{subfolder1,subfolder2,subfolder3,subfolder
david@david-Mint:~$ cd New-Dir/
david@david-Mint:~/New-Dir$ ls
subfolder1  subfolder2  subfolder3  subfolder4
david@david-Mint:~/New-Dir$
```

## FORGOTTEN COMMANDS

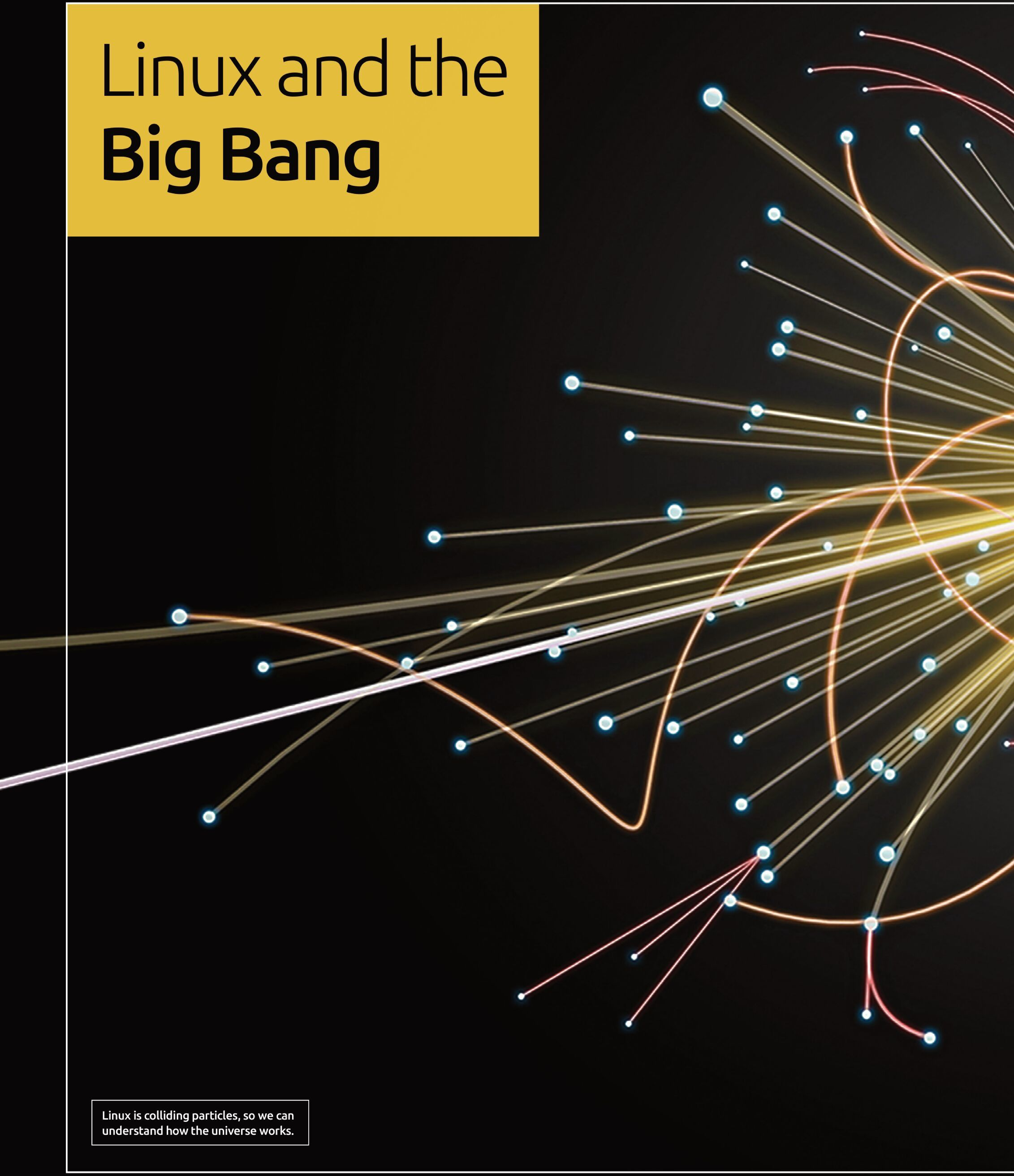
It's not easy trying to remember all the available Linux commands. Thankfully, we can use apropos to help us. Simply use it, along with a description of the command:

```
apropos "copy files"
apropos "rename files"
```

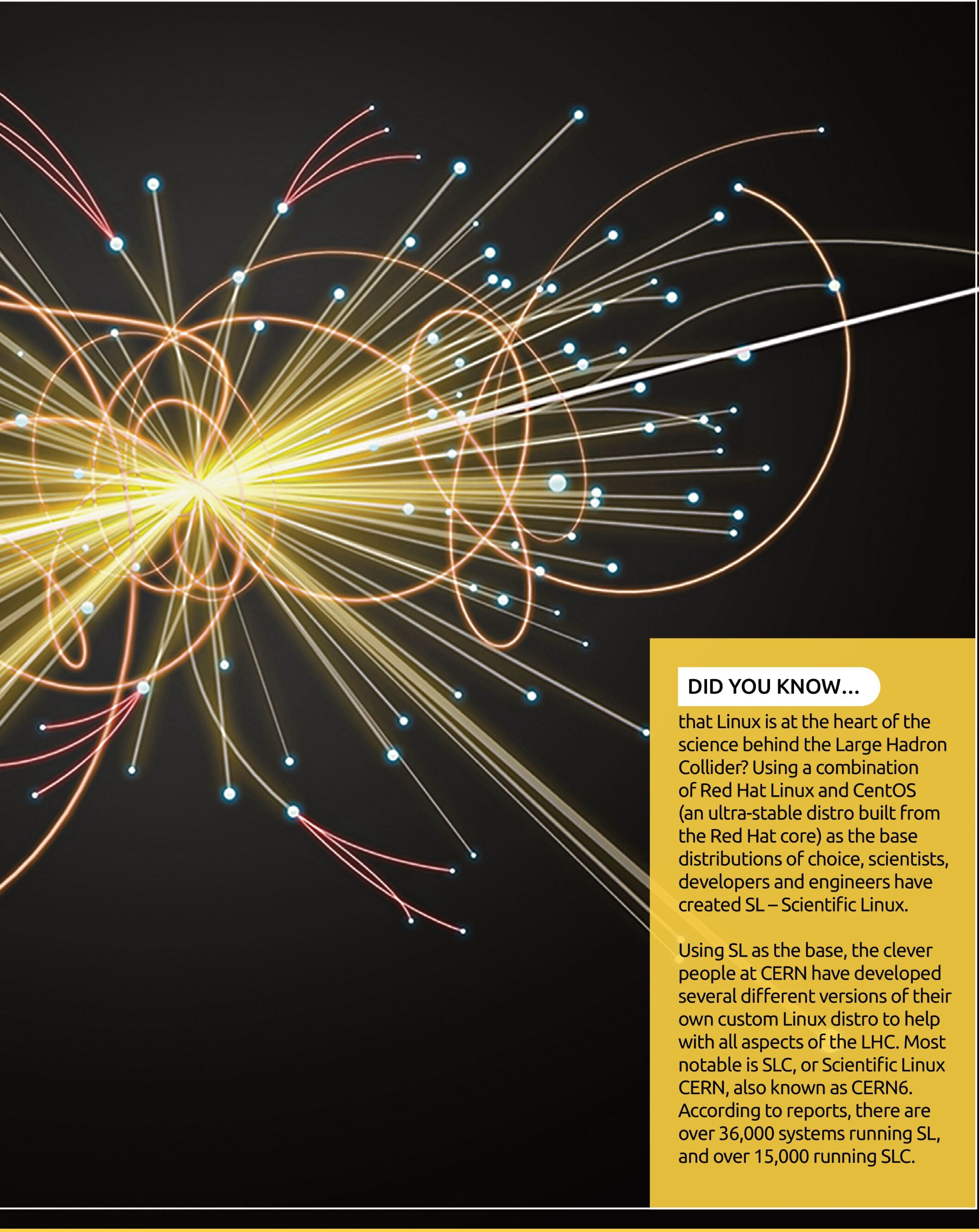


```
david@david-Mint: ~
david@david-Mint:~$ apropos "copy files"
cp (1)               - copy files and directories
cpio (1)             - copy files to and from archives
install (1)          - copy files and set attributes
david@david-Mint:~$ apropos "rename files"
rename.ul (1)        - rename files
zipnote (1)          - write the comments in zipfile to stdout, edit comments and rename
david@david-Mint:~$ 
```

# Linux and the **Big Bang**



Linux is colliding particles, so we can understand how the universe works.



## DID YOU KNOW...

that Linux is at the heart of the science behind the Large Hadron Collider? Using a combination of Red Hat Linux and CentOS (an ultra-stable distro built from the Red Hat core) as the base distributions of choice, scientists, developers and engineers have created SL – Scientific Linux.

Using SL as the base, the clever people at CERN have developed several different versions of their own custom Linux distro to help with all aspects of the LHC. Most notable is SLC, or Scientific Linux CERN, also known as CERN6. According to reports, there are over 36,000 systems running SL, and over 15,000 running SLC.

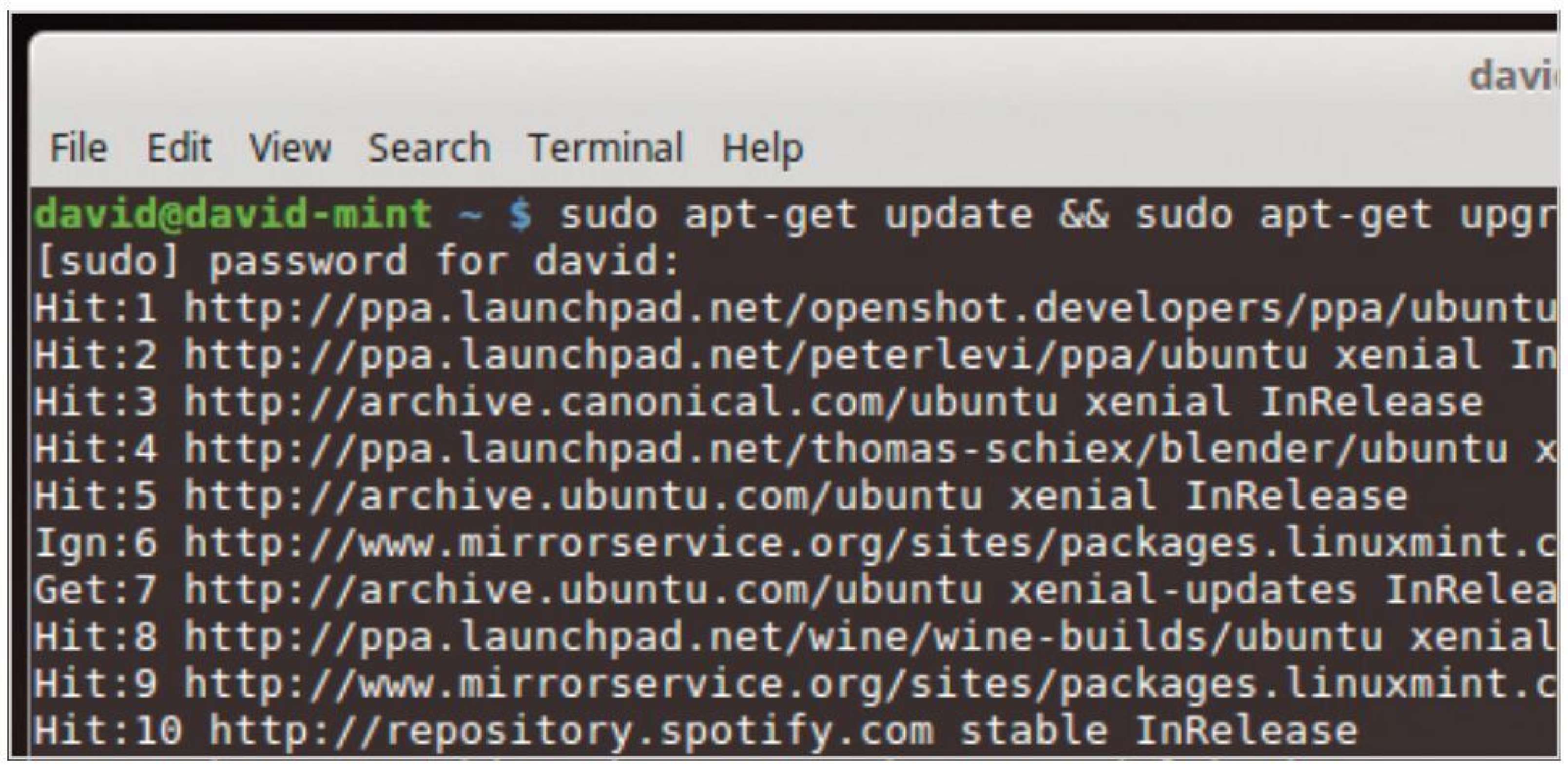
# Creating Bash Scripts – Part 1

Eventually, as you advance with Linux Mint, you'll want to start creating your own automated tasks and programs. These are essentially scripts, Bash Shell scripts to be exact, and they work in the same way as a DOS Batch file does, or any other programming language.

## GET SCRIPTING

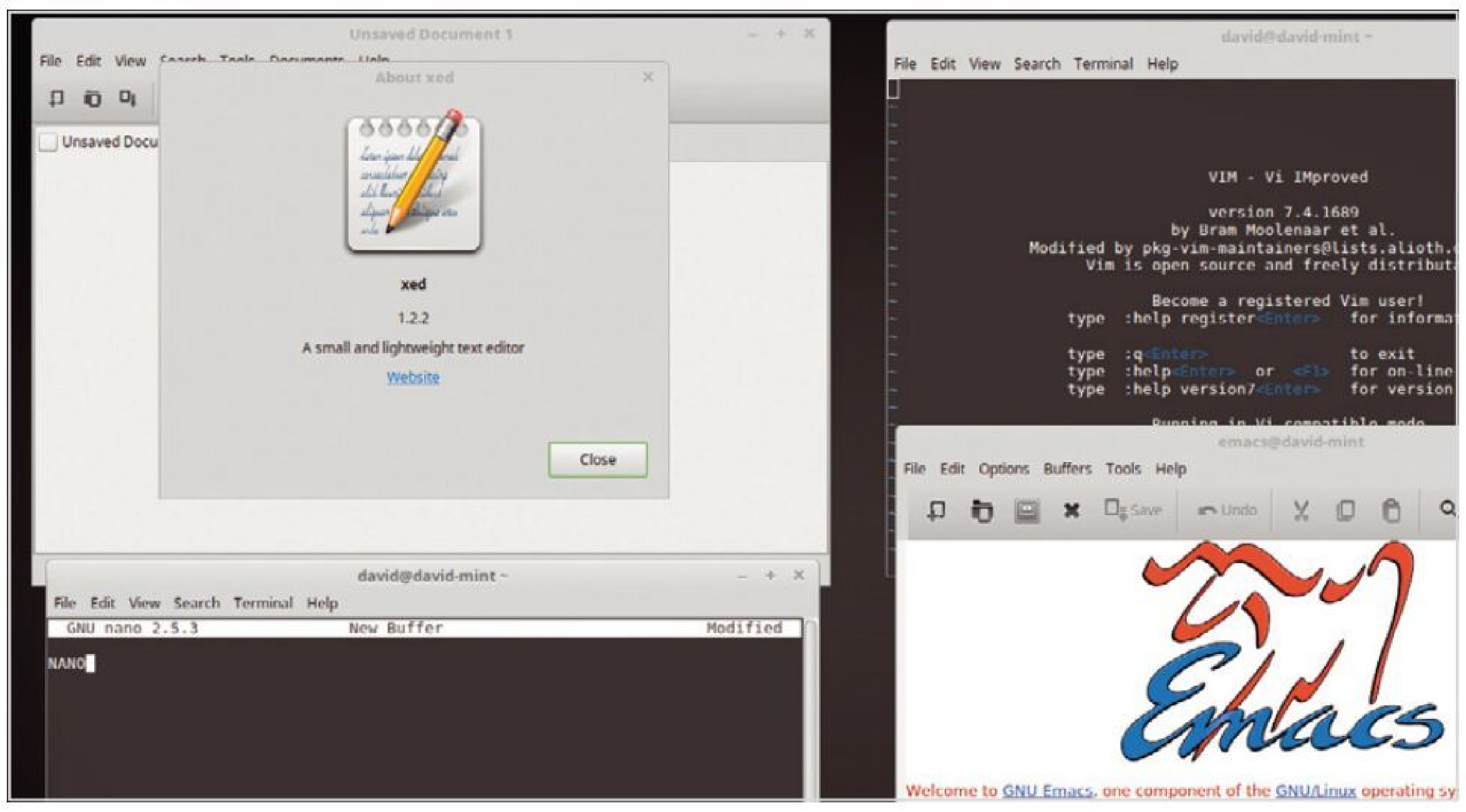
**A Bash script is simply a series of commands that Mint will run through to complete a certain task. They can be simple or remarkably complex, it all depends on the situation.**

**STEP 1** You'll be working within the Terminal and with a text editor throughout the coming pages. There are alternatives to the text editor, which we'll look at in a moment but for the sake of ease, we'll be doing our examples in Xed. Before you begin, however, run through the customary update check: `sudo apt-get update && sudo apt-get upgrade`.


davi
File Edit View Search Terminal Help

```
david@david-mint ~ $ sudo apt-get update && sudo apt-get upgr
[sudo] password for david:
Hit:1 http://ppa.launchpad.net/openshot.developers/ppa/ubuntu
Hit:2 http://ppa.launchpad.net/peterlevi/ppa/ubuntu xenial In
Hit:3 http://archive.canonical.com/ubuntu xenial InRelease
Hit:4 http://ppa.launchpad.net/thomas-schiex/blender/ubuntu x
Hit:5 http://archive.ubuntu.com/ubuntu xenial InRelease
Ign:6 http://www.mirrorservice.org/sites/packages.linuxmint.c
Get:7 http://archive.ubuntu.com/ubuntu xenial-updates InRelea
Hit:8 http://ppa.launchpad.net/wine/wine-builds/ubuntu xenial
Hit:9 http://www.mirrorservice.org/sites/packages.linuxmint.c
Hit:10 http://repository.spotify.com stable InRelease
```

**STEP 2** There are several text editors we can use to create a Bash script: Xed, Vi, Nano, Vim, GNU Emacs and so on. In the end it all comes down to personal preference. Our use of Xed is purely due to making it easier to read the script in the screenshots you see below.


Unsaved Document 1
File Edit View Search Tools Documents Help
Unsaved Docu
About xed
xed
1.2.2
A small and lightweight text editor
Website
Close
david@david-mint ~
File Edit View Search Terminal Help
david@david-mint ~
File Edit View Search Terminal Help
emacs@david-mint
File Edit Options Buffers Tools Help
Save
Undo
Emacs
Welcome to GNU Emacs, one component of the GNU/Linux operating sy

```
  GNU nano 2.5.3                New Buffer                       Modified

NANO
```

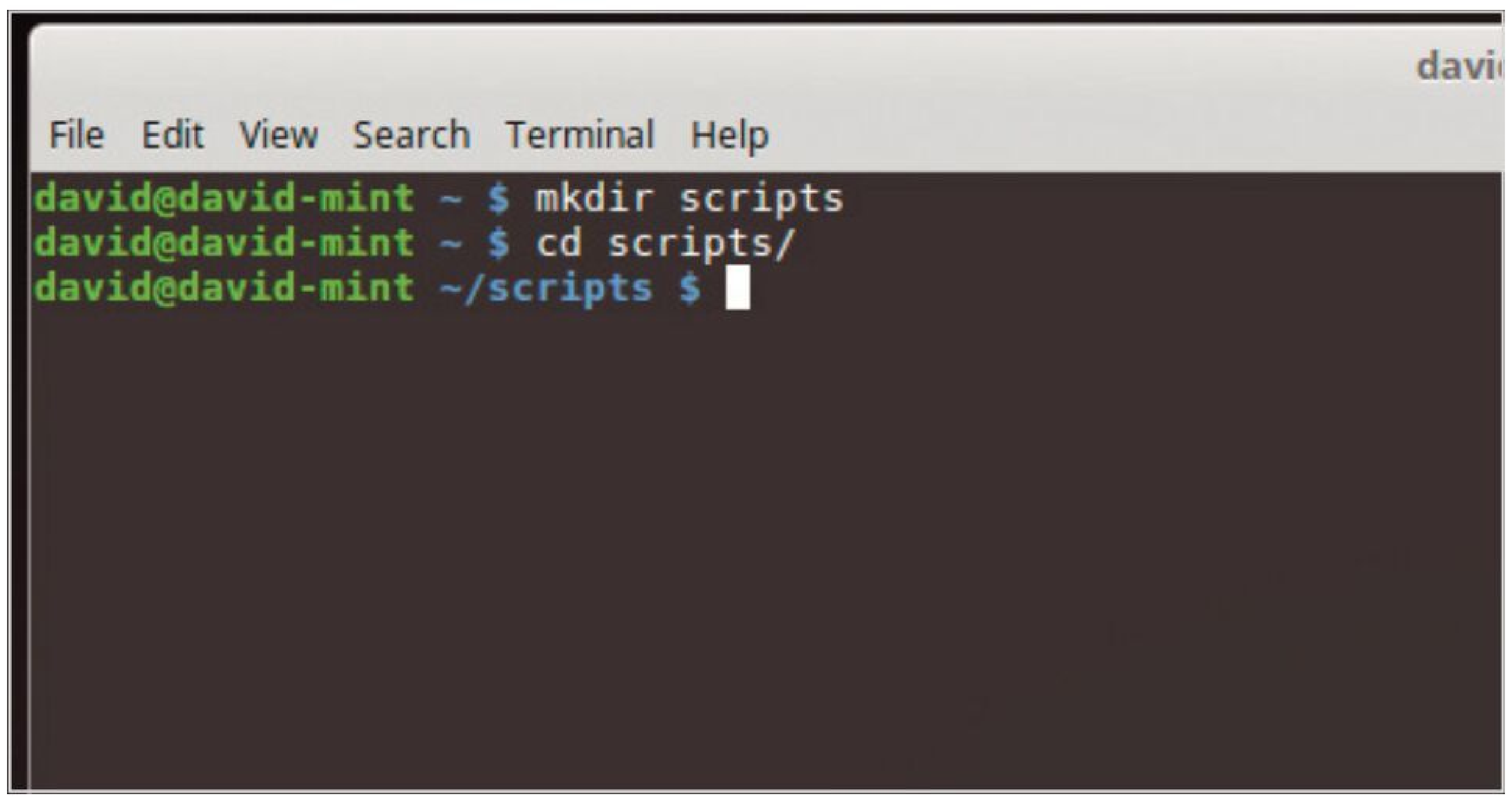
```
                    VIM - Vi IMproved

                    version 7.4.1689
                by Bram Moolenaar et al.
  Modified by pkg-vim-maintainers@lists.alioth.
     Vim is open source and freely distribut

              Become a registered Vim user!
   type  :help register<Enter>   for informa

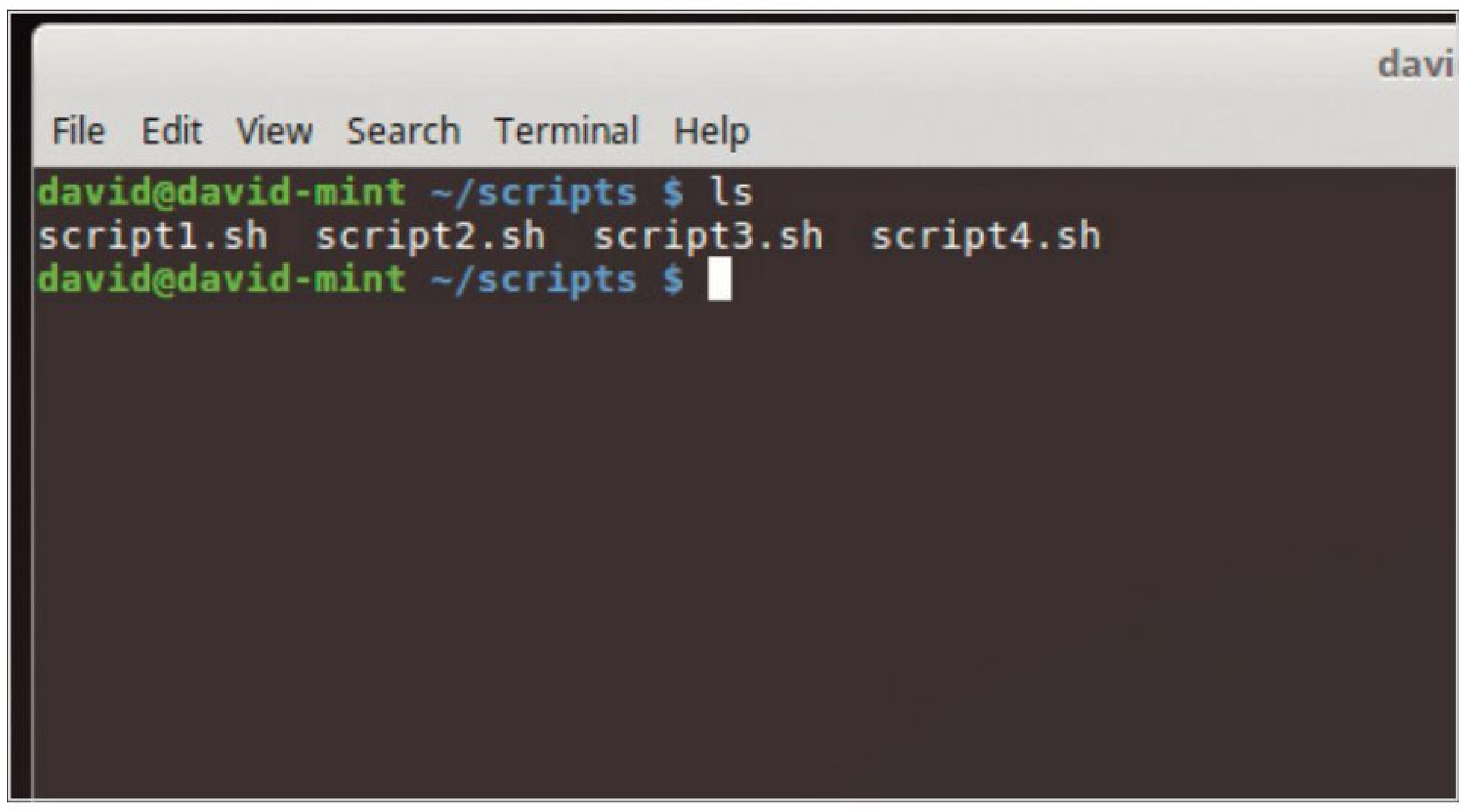
   type  :q<Enter>               to exit
   type  :help<Enter>  or  <F1>  for on-line
   type  :help version7<Enter>   for version
```

**STEP 3** To begin with, and before you start to write any scripts, you need to create a folder where you can put all our scripts into. Start with `mkdir scripts`, and enter the folder `cd scripts/`. This will be our working folder and from here you can create sub-folders if you want of each script you create.


davi
File Edit View Search Terminal Help

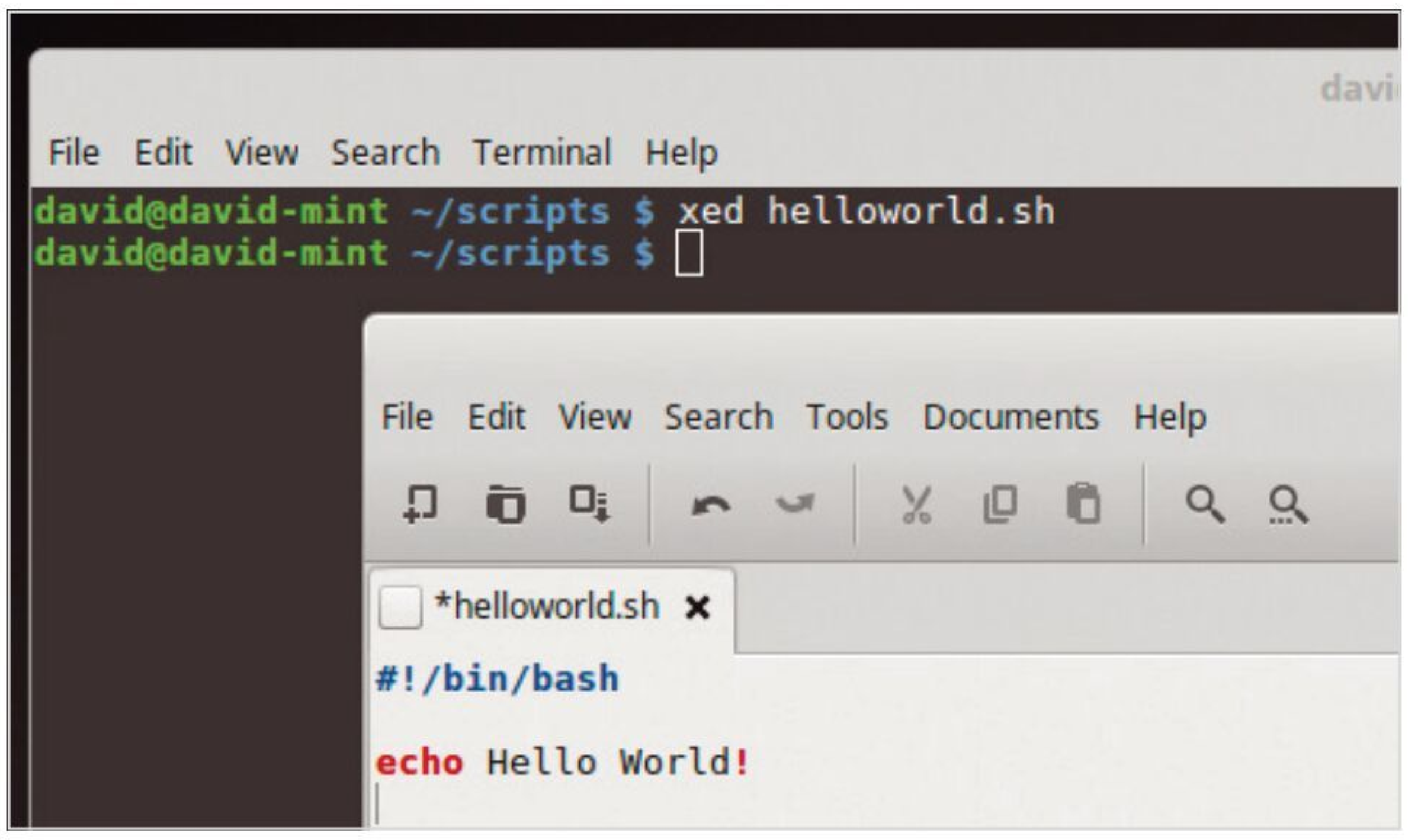
```
david@david-mint ~ $ mkdir scripts
david@david-mint ~ $ cd scripts/
david@david-mint ~/scripts $ 
```

**STEP 4** Windows users will be aware that in order for a batch file to work, as in be executed and follow the programming within it, it needs to have a .BAT file extension. Linux is an extension-less operating system but the convention is to give scripts a .sh extension.


davi
File Edit View Search Terminal Help

```
david@david-mint ~/scripts $ ls
script1.sh  script2.sh  script3.sh  script4.sh
david@david-mint ~/scripts $ 
```

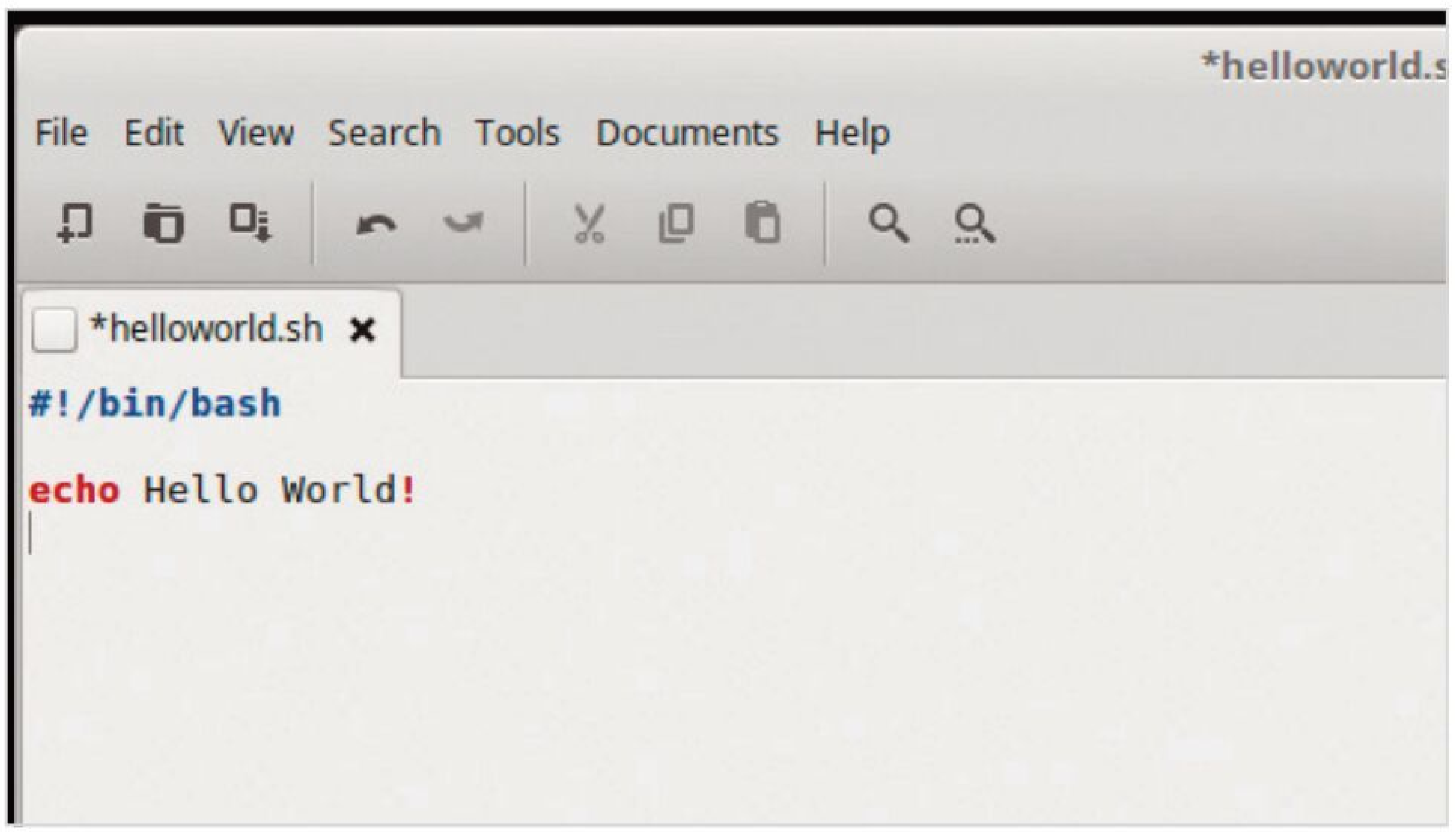
**STEP 5** Let's start with a simple script to output something to the Terminal. Enter `xed helloworld.sh`. This will launch Xed and create a file called helloworld.sh. In Xed, enter the following: `#!/bin/bash`, then on a new line: `echo Hello World!`.



```
david@david-mint ~/scripts $ xed helloworld.sh
david@david-mint ~/scripts $ 
```

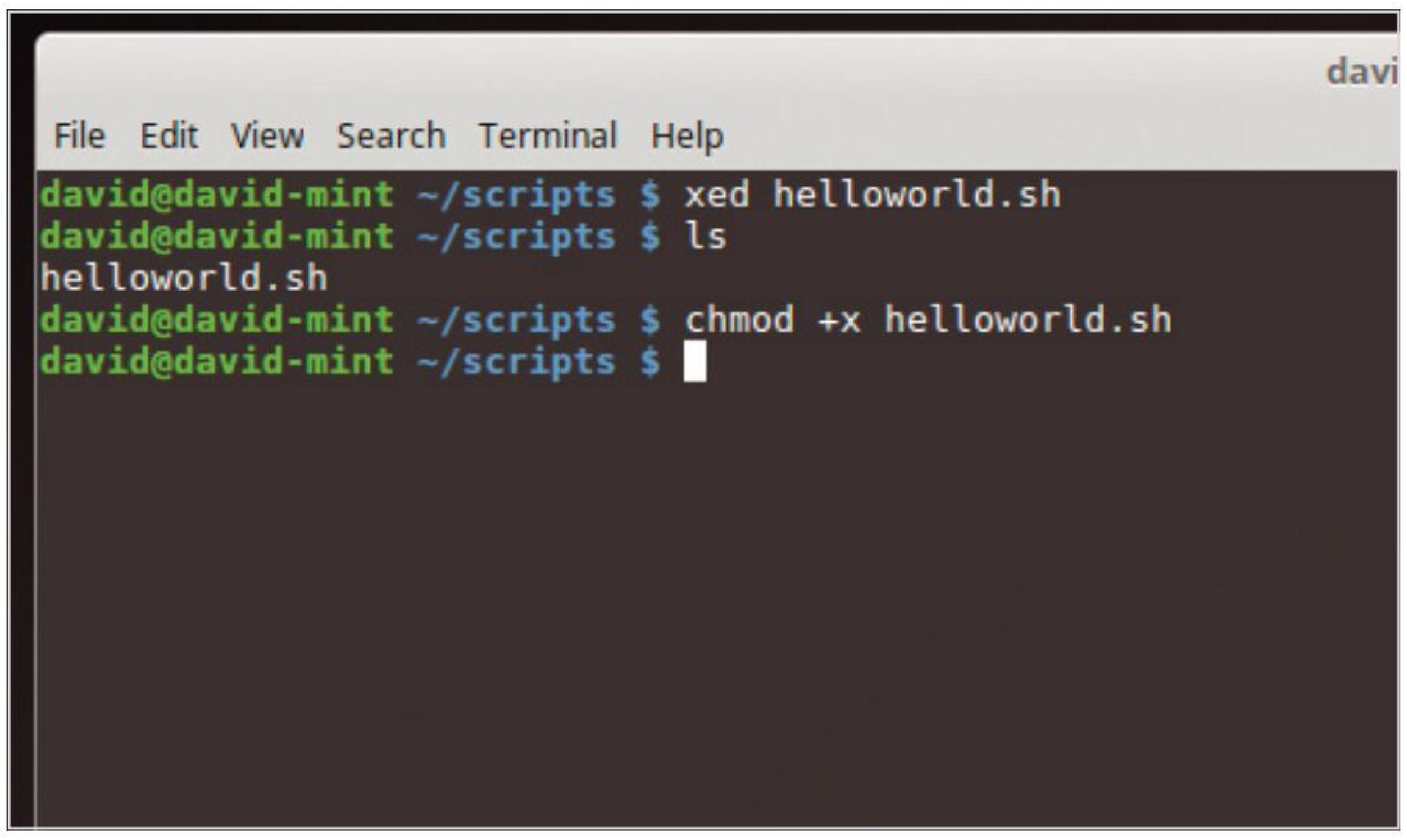
```
#!/bin/bash
echo Hello World!
```

**STEP 6** The `#!/bin/bash` line tells the system what Shell you're going to be using, in this case Bash. The hash (#) denotes a comment line, one that is ignored by the system, the exclamation mark (!) means that the comment is bypassed and will force the script to execute the line as a command. This is also known as a Hash-Bang.



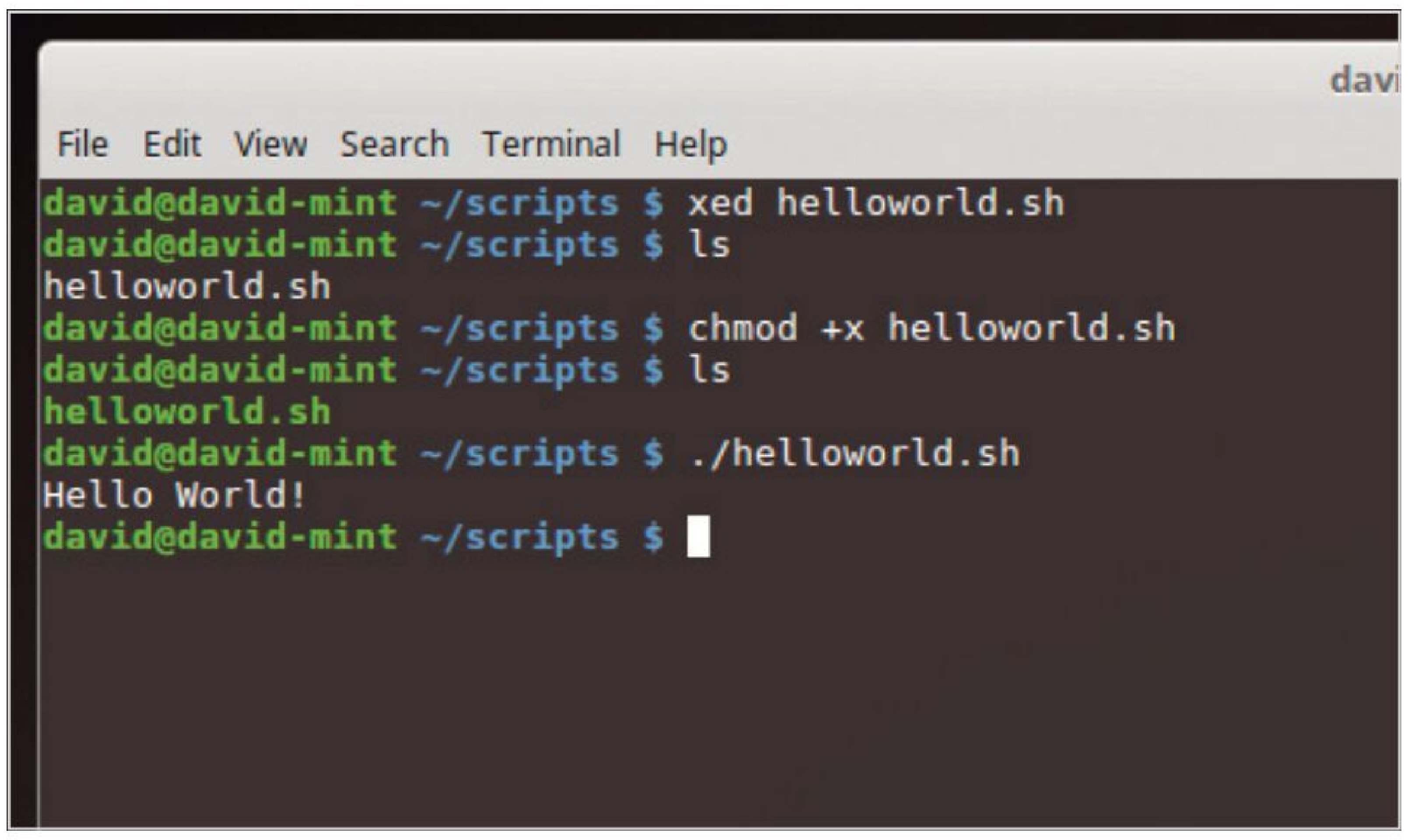
```
#!/bin/bash
echo Hello World!
```

**STEP 7** You can save this file, clicking File > Save, and exit back to the Terminal. Entering `ls`, will reveal the script in the folder. To make any script executable, and able to run, you need to modify its permissions. Do this with `chmod +x helloworld.sh`. You need to do this with every script you create.



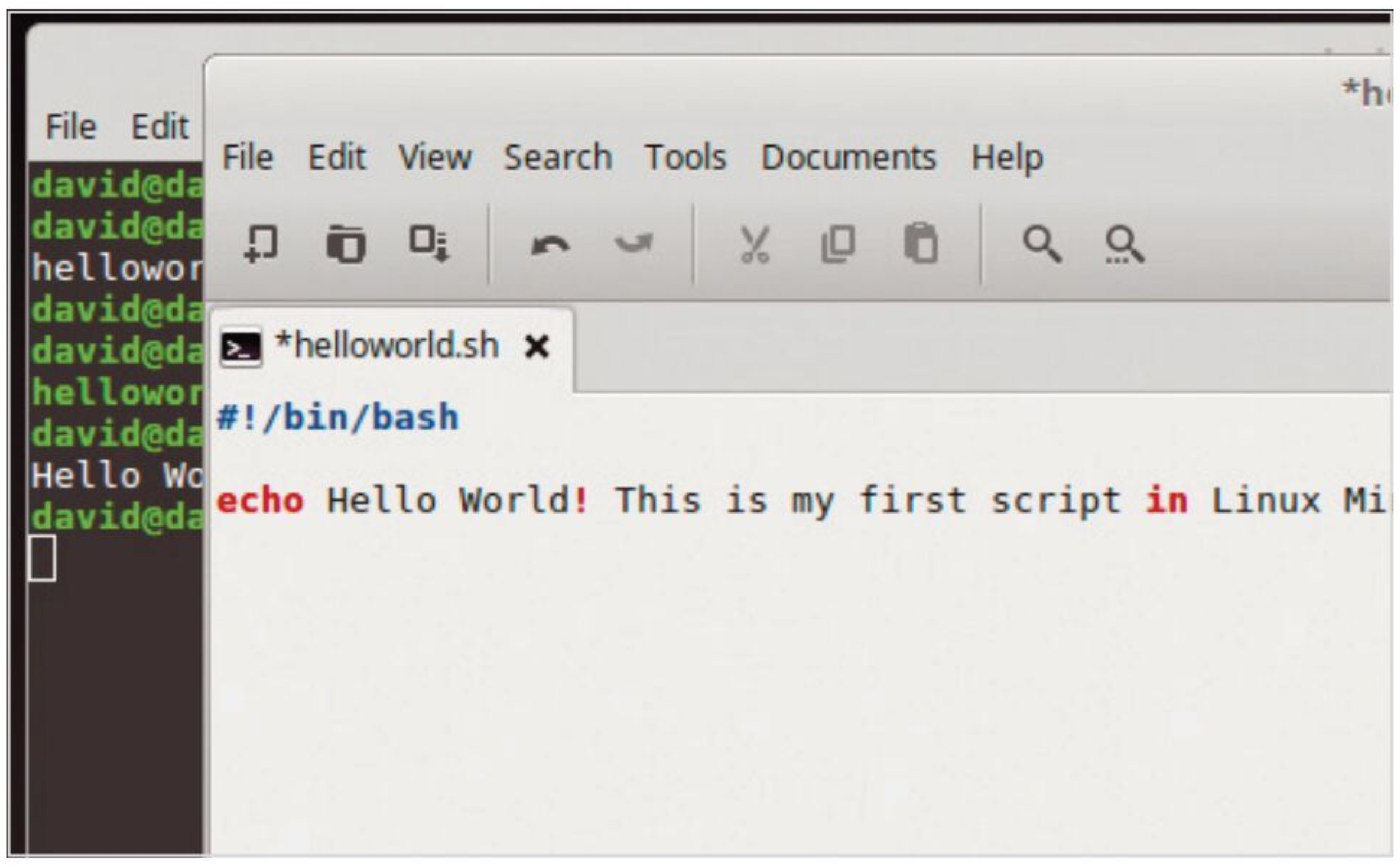
```
david@david-mint ~/scripts $ xed helloworld.sh
david@david-mint ~/scripts $ ls
helloworld.sh
david@david-mint ~/scripts $ chmod +x helloworld.sh
david@david-mint ~/scripts $ 
```

**STEP 8** When you enter `ls` again, you can see that the helloworld.sh script has now turned from being white to green, meaning that it's now an executable file. To run the script, in other words make it do the things you've typed into it, enter: `./helloworld.sh`.



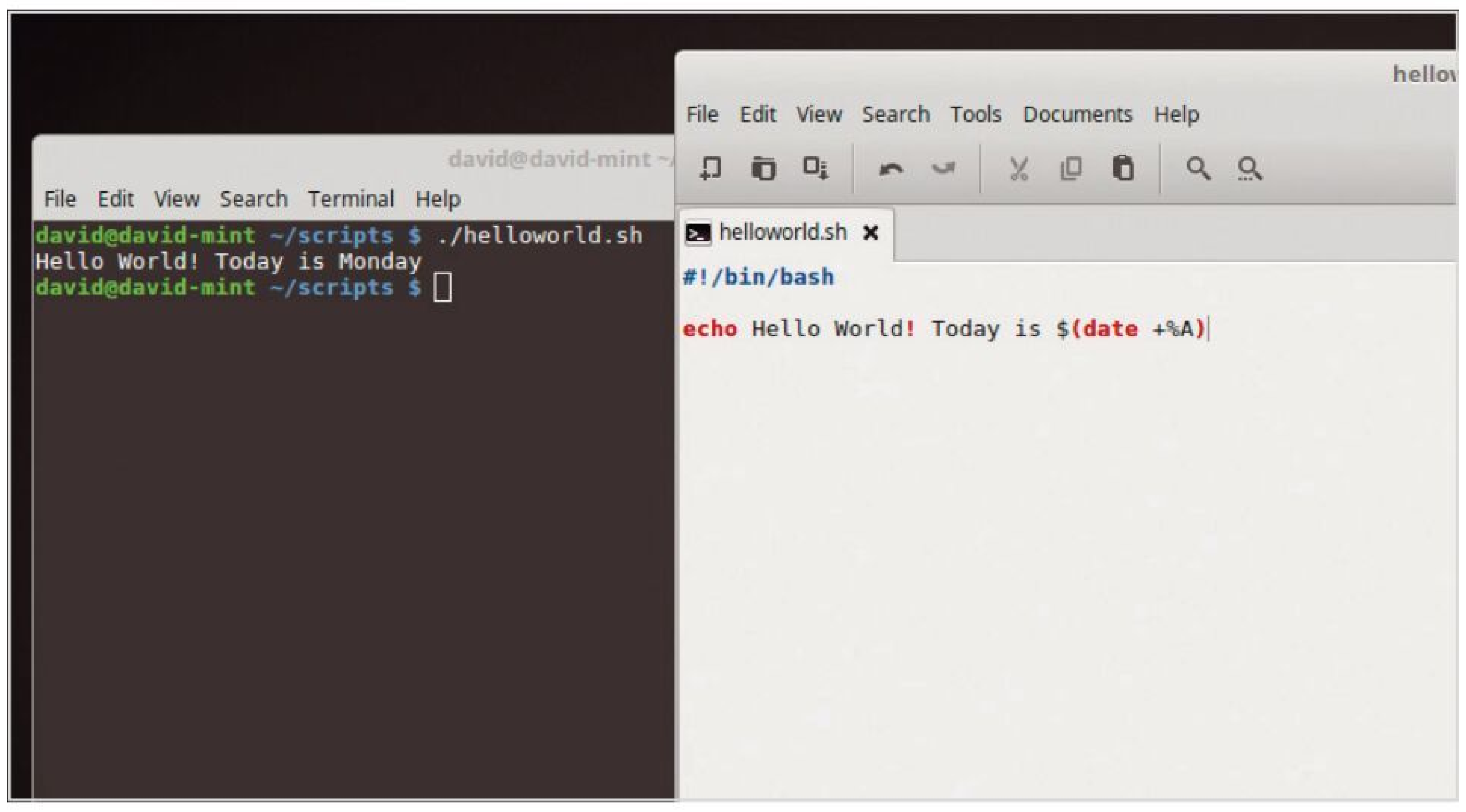
```
david@david-mint ~/scripts $ xed helloworld.sh
david@david-mint ~/scripts $ ls
helloworld.sh
david@david-mint ~/scripts $ chmod +x helloworld.sh
david@david-mint ~/scripts $ ls
helloworld.sh
david@david-mint ~/scripts $ ./helloworld.sh
Hello World!
david@david-mint ~/scripts $ 
```

**STEP 9** Although it's not terribly exciting, the words 'Hello World!' should now be displayed in the Terminal. The echo command is responsible for outputting the words after it in the Terminal, as we move on you can make the echo command output to other sources.



```
#!/bin/bash
echo Hello World! This is my first script in Linux Mi
```

**STEP 10** Think of echo as the old BASIC Print command. It displays either text, numbers or any variables that are stored in the system, such as the current system date. Try this example: `echo Hello World! Today is $(date +%A)`. The $(date +%A) is calling the system variable that stores the current day of the week.



```
david@david-mint ~/scripts $ ./helloworld.sh
Hello World! Today is Monday
david@david-mint ~/scripts $ 
```

```
#!/bin/bash
echo Hello World! Today is $(date +%A)
```

18+

WHAT IS

AVAXHOME?

AVAXHOME -

the biggest Internet portal, providing you various content: brand new books, trending movies, fresh magazines, hot games, recent software, latest music releases.

Unlimited satisfaction one low price
Cheap constant access to piping hot media
Protect your downloadings from Big brother
Safer, than torrent-trackers

18 years of seamless operation and our users' satisfaction

All languages
Brand new content
One site

AVXLIVE.ICU

AvaxHome - Your End Place

We have everything for all of your needs. Just open https://avxlive.icu

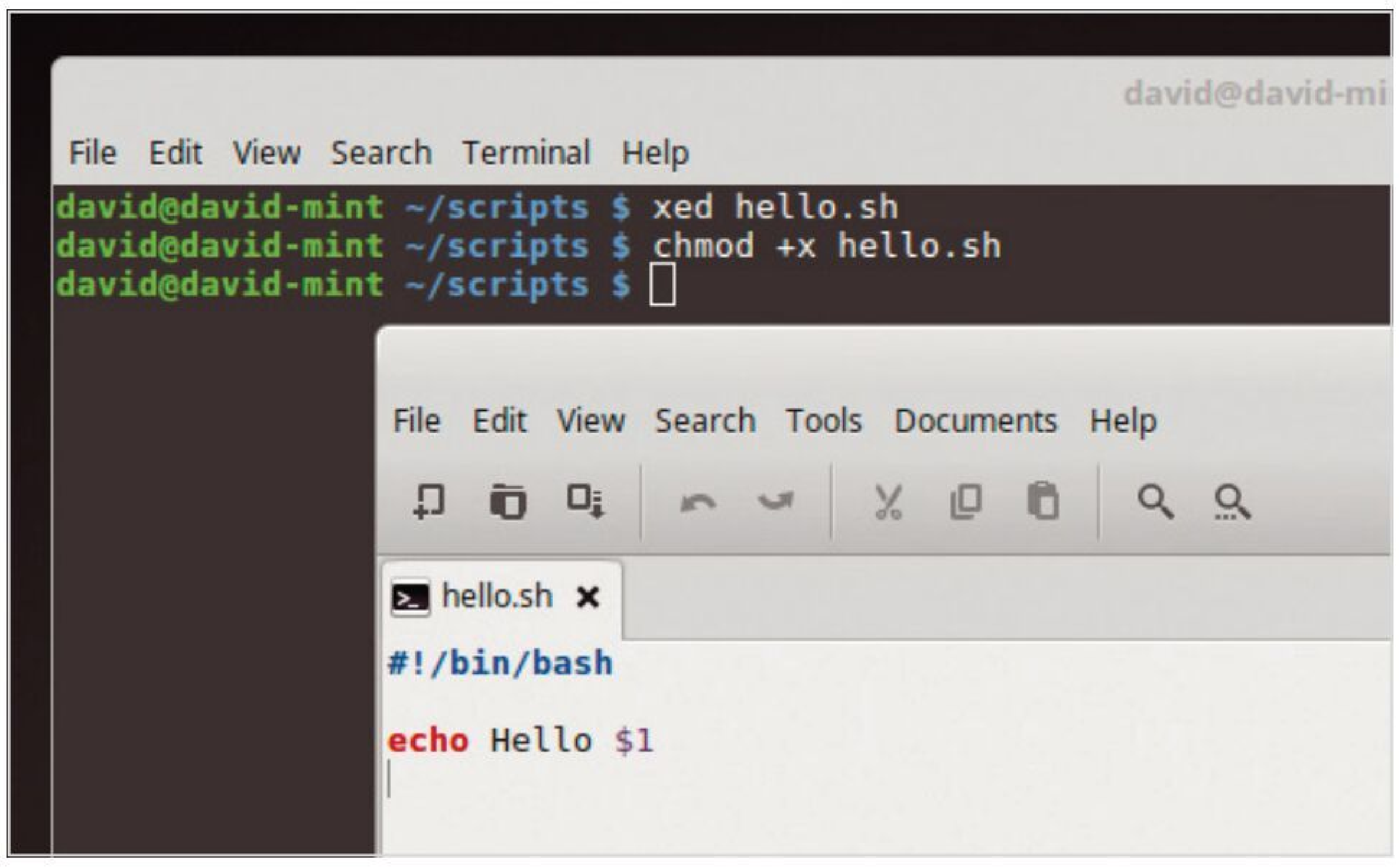
# Creating Bash Scripts – Part 2

Previously we looked at creating your first Bash script, Hello World, and adding a system variable. Now you can expand these and see what you can do when you start to play around with creating your own unique variables.

## VARIABLES

**Just as in every other programming language a Bash script can store and call certain variables from the system, either generic or user created.**

**STEP 1** Let's start by creating a new script called hello.sh; `xed hello.sh`. In it enter: `#!/bin/bash`, then, echo `Hello $1`. Save the file and exit Xed. Back in the Terminal make the script executable with: `chmod +x hello.sh`.

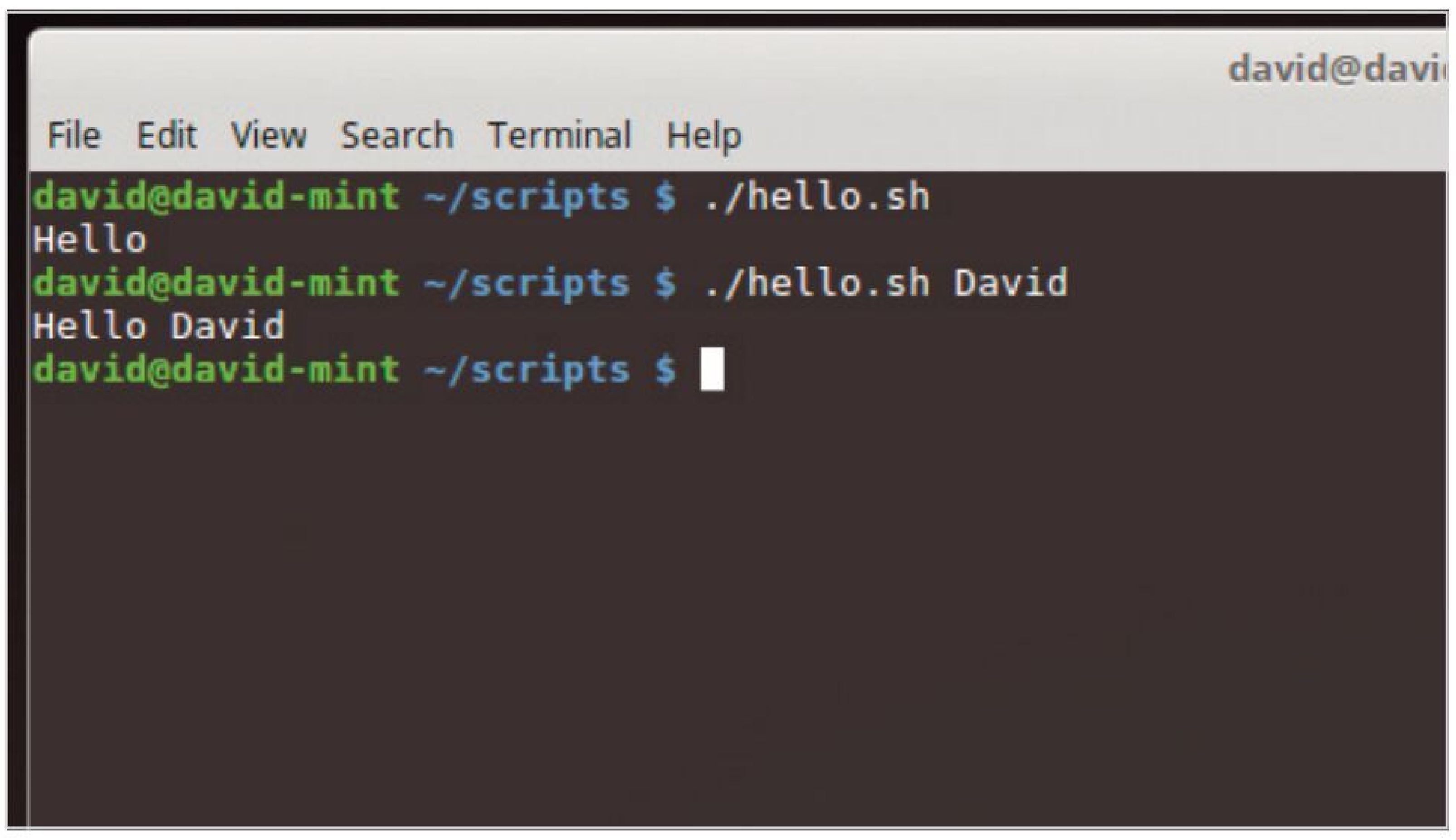

david@david-mi
File Edit View Search Terminal Help
File Edit View Search Tools Documents Help
hello.sh

```
david@david-mint ~/scripts $ xed hello.sh
david@david-mint ~/scripts $ chmod +x hello.sh
david@david-mint ~/scripts $ 
```

```
#!/bin/bash

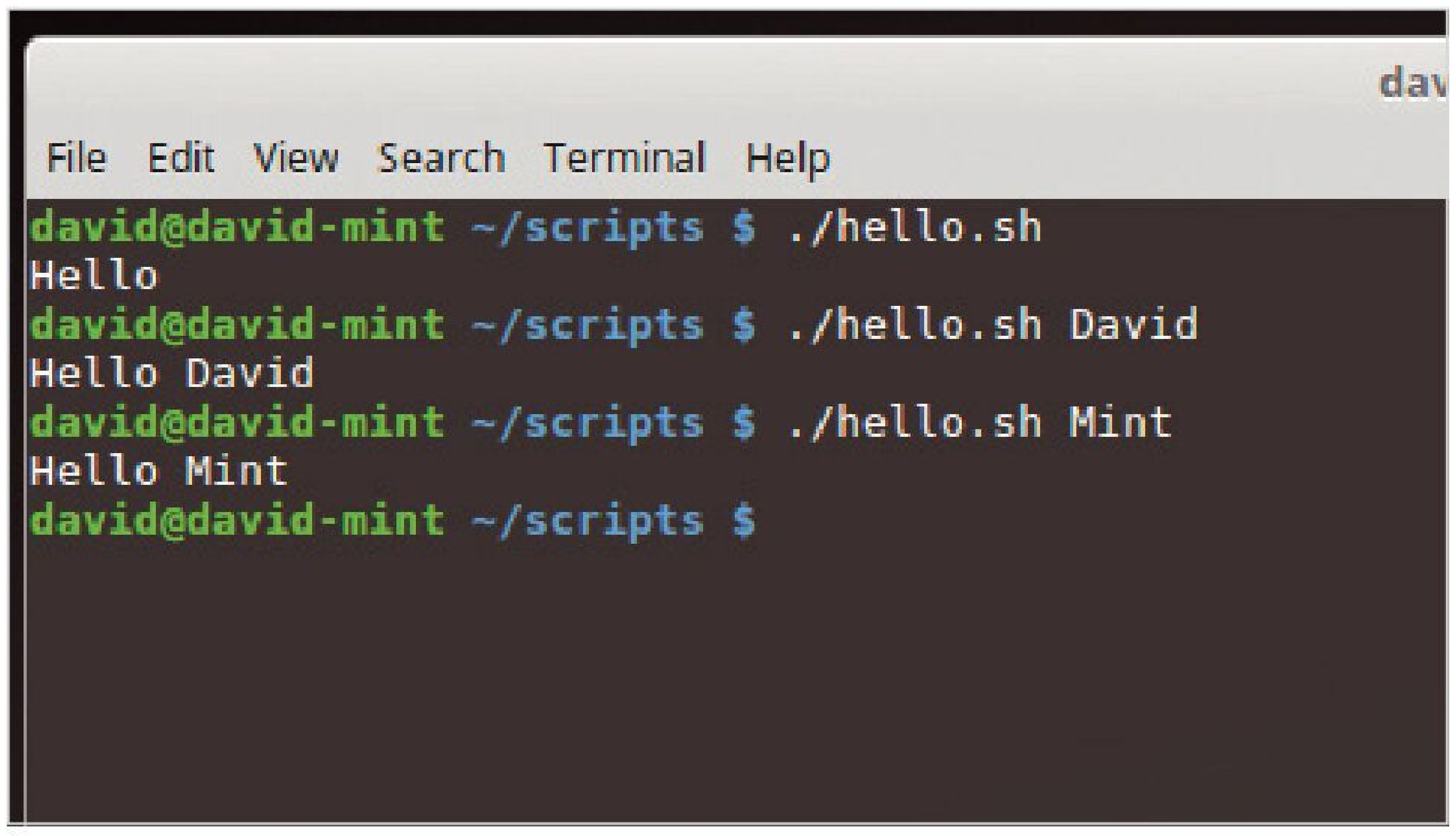
echo Hello $1
```

**STEP 2** As the script is now executable, run it with `./hello.sh`. Now, as you probably expected a simple 'Hello' is displayed in the Terminal. However, if you then issue the command with a variable, it begins to get interesting. For example, try `./hello.sh David`.


david@davi
File Edit View Search Terminal Help

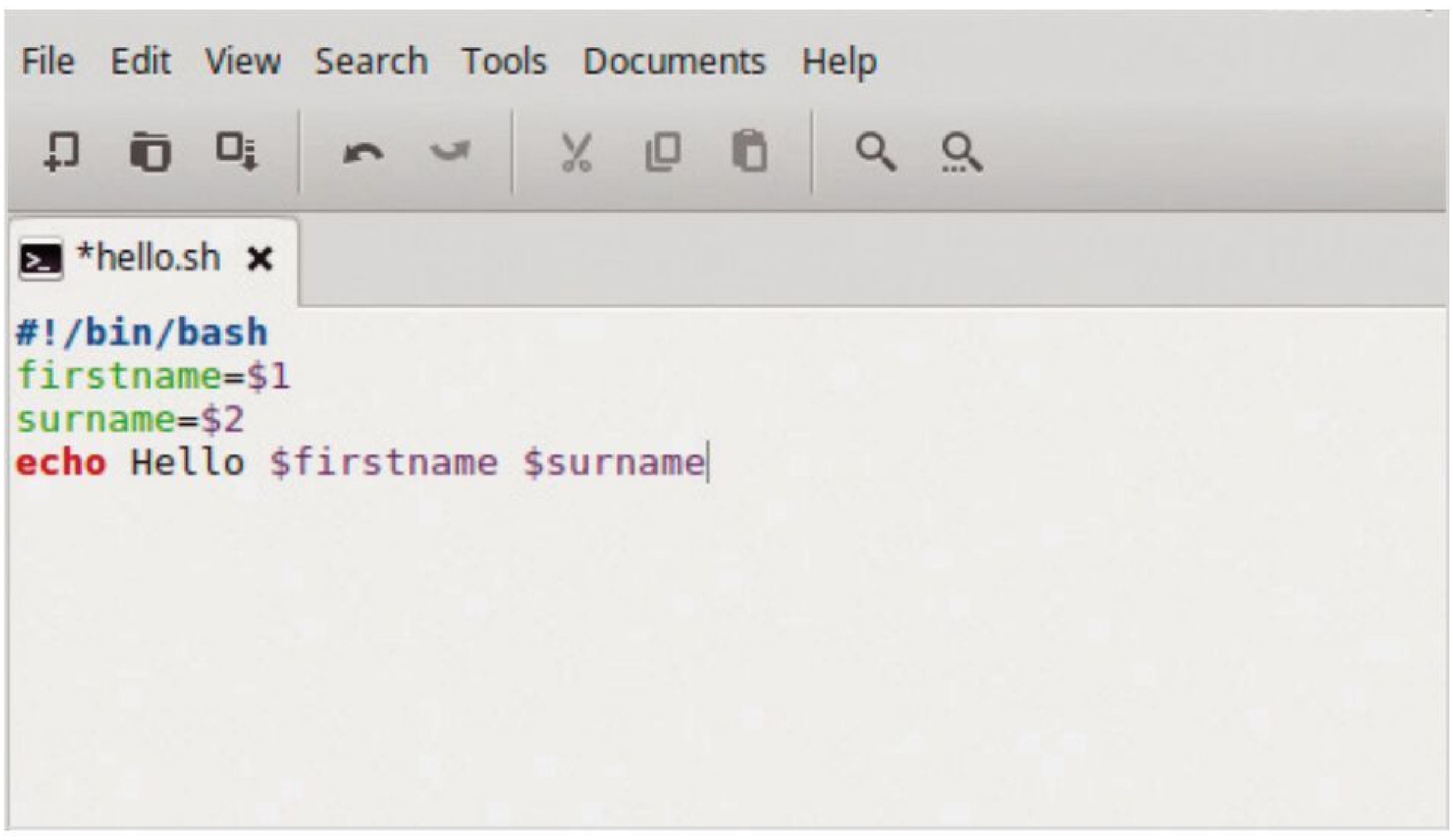
```
david@david-mint ~/scripts $ ./hello.sh
Hello
david@david-mint ~/scripts $ ./hello.sh David
Hello David
david@david-mint ~/scripts $ 
```

**STEP 3** The output now will be Hello David. This is because Bash automatically assigns variables for the user, which are then held and passed to the script. So the variable '$1' now holds 'David'. You can change the variable by entering something different: `./hello.sh Mint`.


dav
File Edit View Search Terminal Help

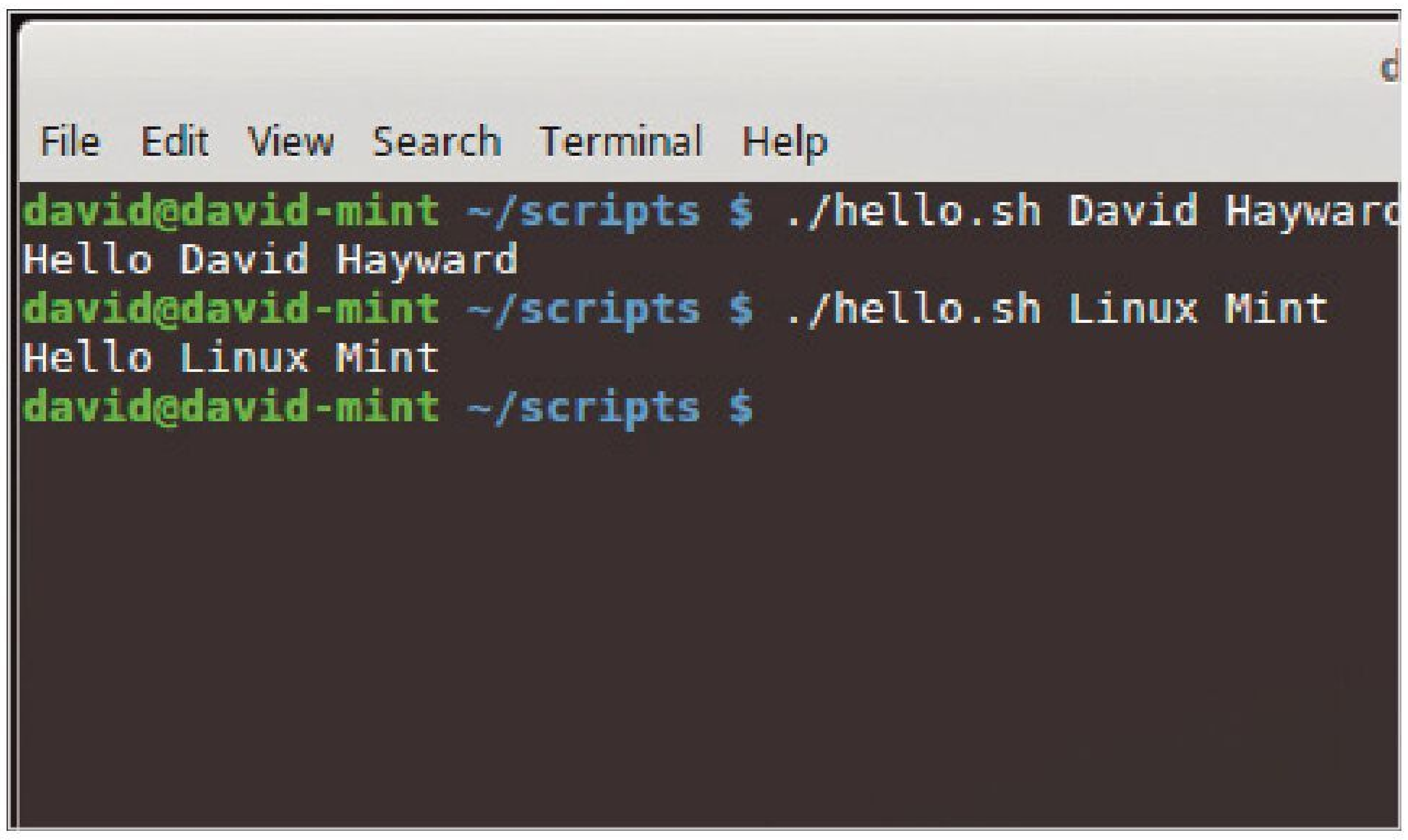
```
david@david-mint ~/scripts $ ./hello.sh
Hello
david@david-mint ~/scripts $ ./hello.sh David
Hello David
david@david-mint ~/scripts $ ./hello.sh Mint
Hello Mint
david@david-mint ~/scripts $
```

**STEP 4** You can even rename variables. Modify the hello.sh script with the following: `firstname=$1, surname=$2, echo Hello $firstname $surname`. Putting each statement on a new line. Save the script and exit back into the Terminal.


File Edit View Search Tools Documents Help
*hello.sh

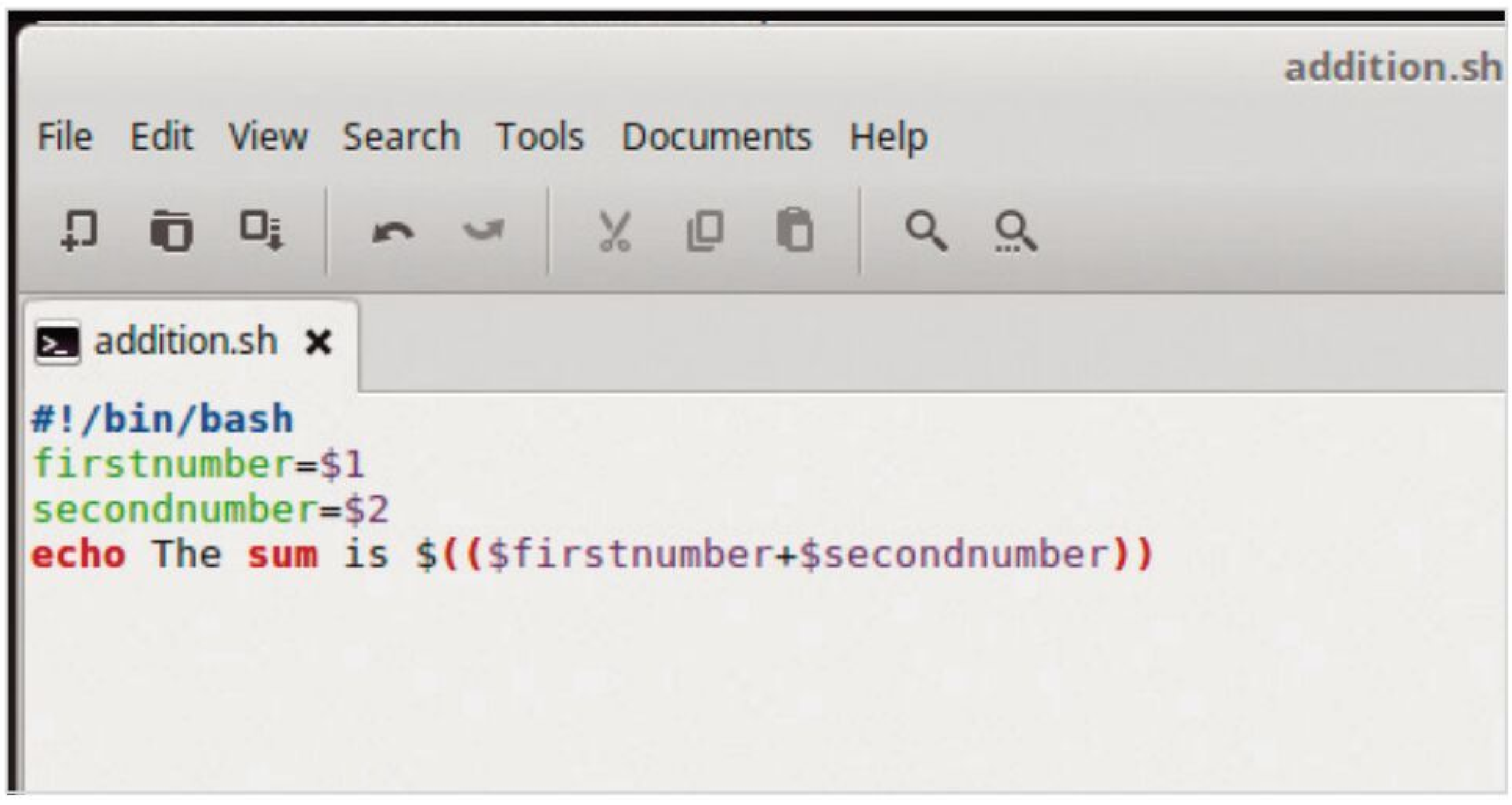
```
#!/bin/bash
firstname=$1
surname=$2
echo Hello $firstname $surname
```

**STEP 5** When you run the script now you can use two custom variables: `./hello.sh David Hayward`. Naturally change the two variables with your own name; unless you're also called David Hayward. At the moment we're just printing the contents, so let's expand the two-variable use a little.


d
File Edit View Search Terminal Help

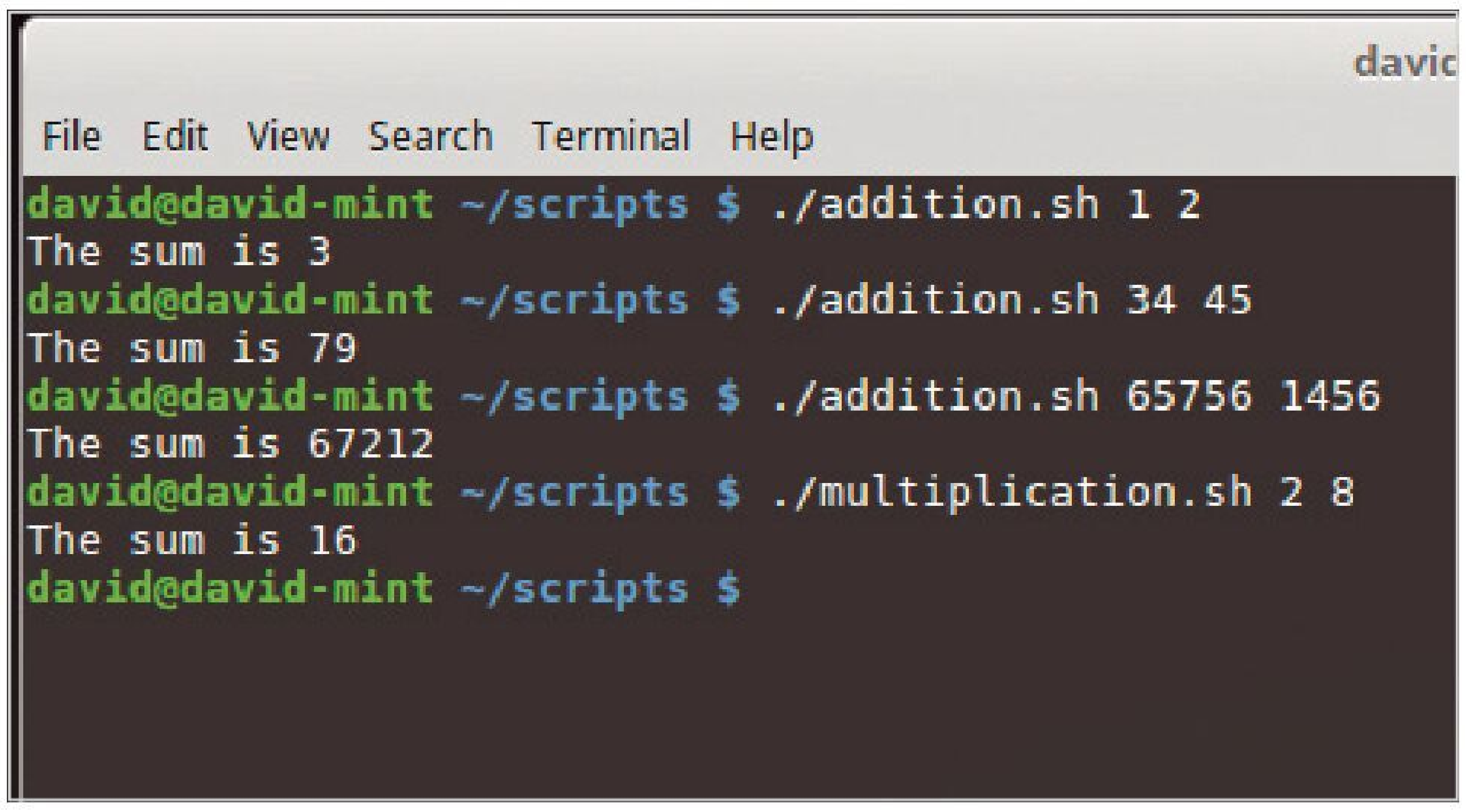
```
david@david-mint ~/scripts $ ./hello.sh David Haywarc
Hello David Hayward
david@david-mint ~/scripts $ ./hello.sh Linux Mint
Hello Linux Mint
david@david-mint ~/scripts $
```

**STEP 6** Create a new script called `addition.sh`, using the same format as the hello.sh script, but changing the variable names. Here we've added `firstnumber` and `secondnumber`, and used the echo command to output some simple arithmetic by placing an integer expression, `echo The sum is $(($firstnumber+$secondnumber))`. Save the script, and make it executable `(chmod +x addition.sh)`.


addition.sh
File Edit View Search Tools Documents Help
addition.sh

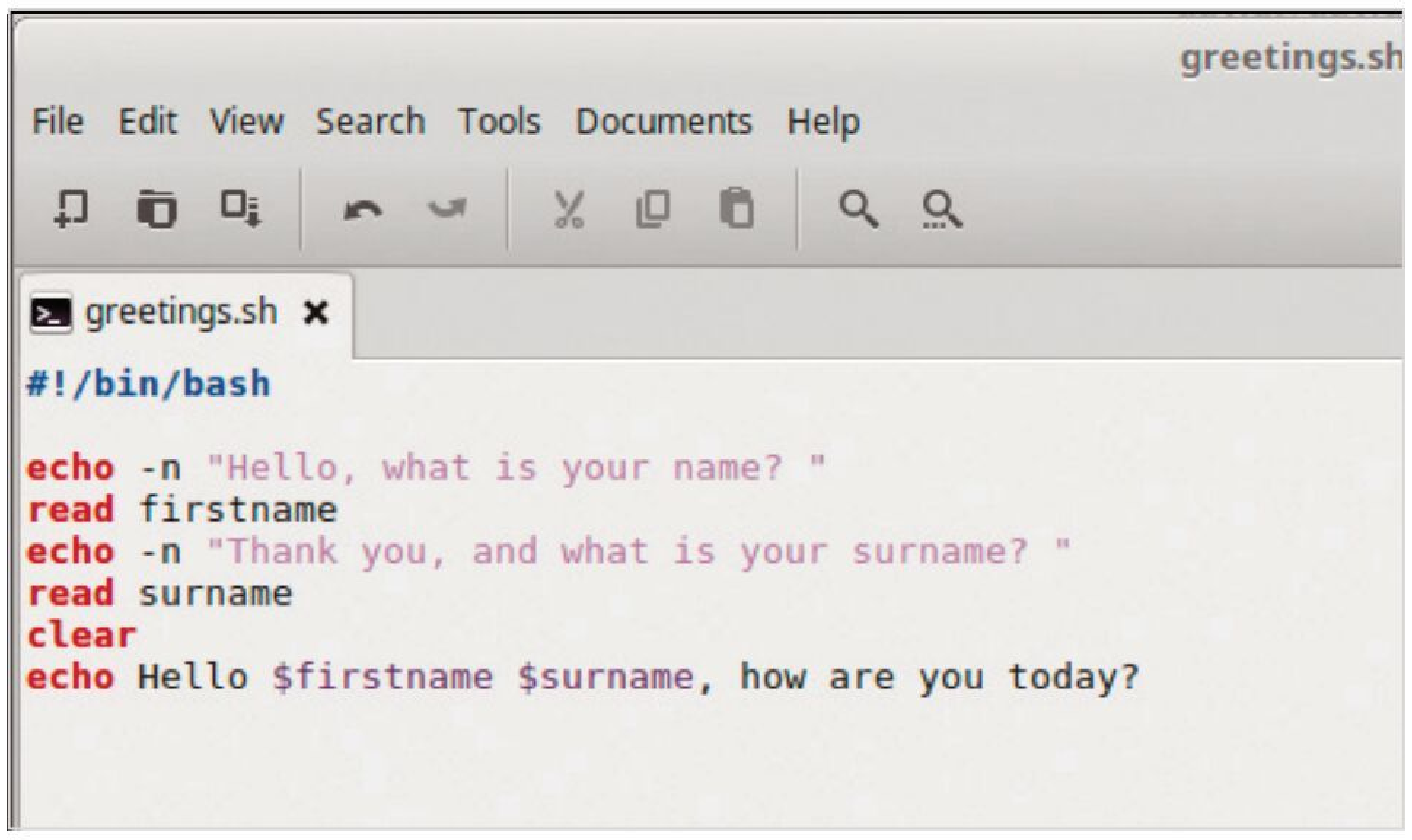
```
#!/bin/bash
firstnumber=$1
secondnumber=$2
echo The sum is $(($firstnumber+$secondnumber))
```

**STEP 7** When you now run the addition.sh script we can enter two numbers: `./addition.sh 1 2`. The result will hopefully be 3, with the Terminal displaying 'The sum is 3'. Try it with a few different numbers and see what happens. See also if you can alter the script and rename it do multiplication, and subtraction.


davic
File Edit View Search Terminal Help

```
david@david-mint ~/scripts $ ./addition.sh 1 2
The sum is 3
david@david-mint ~/scripts $ ./addition.sh 34 45
The sum is 79
david@david-mint ~/scripts $ ./addition.sh 65756 1456
The sum is 67212
david@david-mint ~/scripts $ ./multiplication.sh 2 8
The sum is 16
david@david-mint ~/scripts $
```

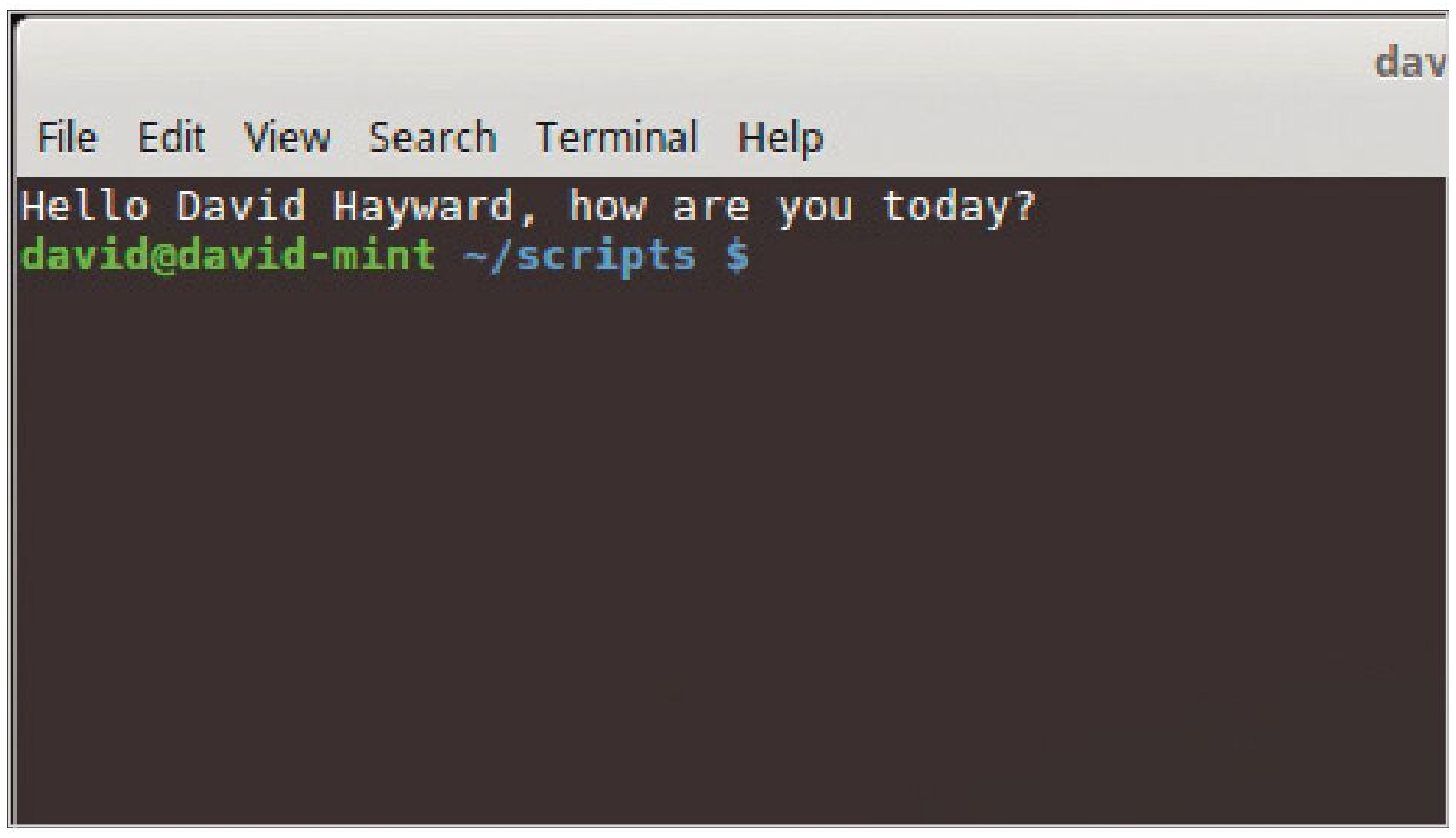
**STEP 8** Let's expand things further. Create a new script called `greetings.sh`. Enter the scripting as below in the screenshot, save it and make it executable with the `chmod` command. You can see that there are a few new additions to the script now.


greetings.sh
File Edit View Search Tools Documents Help
greetings.sh

```
#!/bin/bash

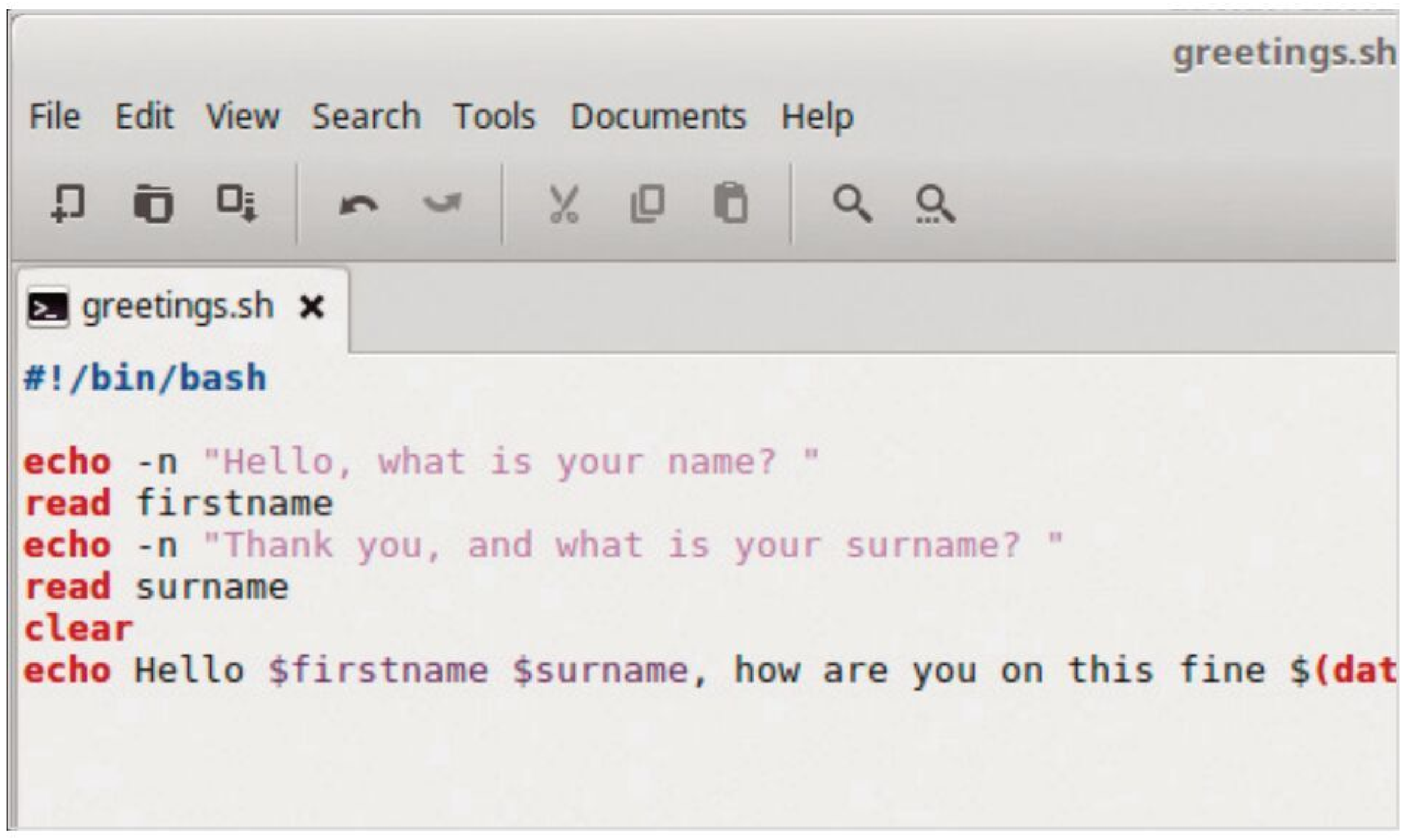
echo -n "Hello, what is your name? "
read firstname
echo -n "Thank you, and what is your surname? "
read surname
clear
echo Hello $firstname $surname, how are you today?
```

**STEP 9** We've added a `–n` to the echo command here which will leave the cursor on the same line as the question, instead of a new line. The `read` command stores the users' input as the variables firstname and surname, to then read back later in the last `echo` line. And the `clear` command clears the screen.


dav
File Edit View Search Terminal Help

```
Hello David Hayward, how are you today?
david@david-mint ~/scripts $
```

**STEP 10** As a final addition, let's include the date variable we used in the last section. Amend the last line of the script to read: `echo Hello $firstname $surname, how are you on this fine $(date +%A)?`. The output should display the current day of the week, calling it from a system variable.


greetings.sh
File Edit View Search Tools Documents Help
greetings.sh

```
#!/bin/bash

echo -n "Hello, what is your name? "
read firstname
echo -n "Thank you, and what is your surname? "
read surname
clear
echo Hello $firstname $surname, how are you on this fine $(dat
```

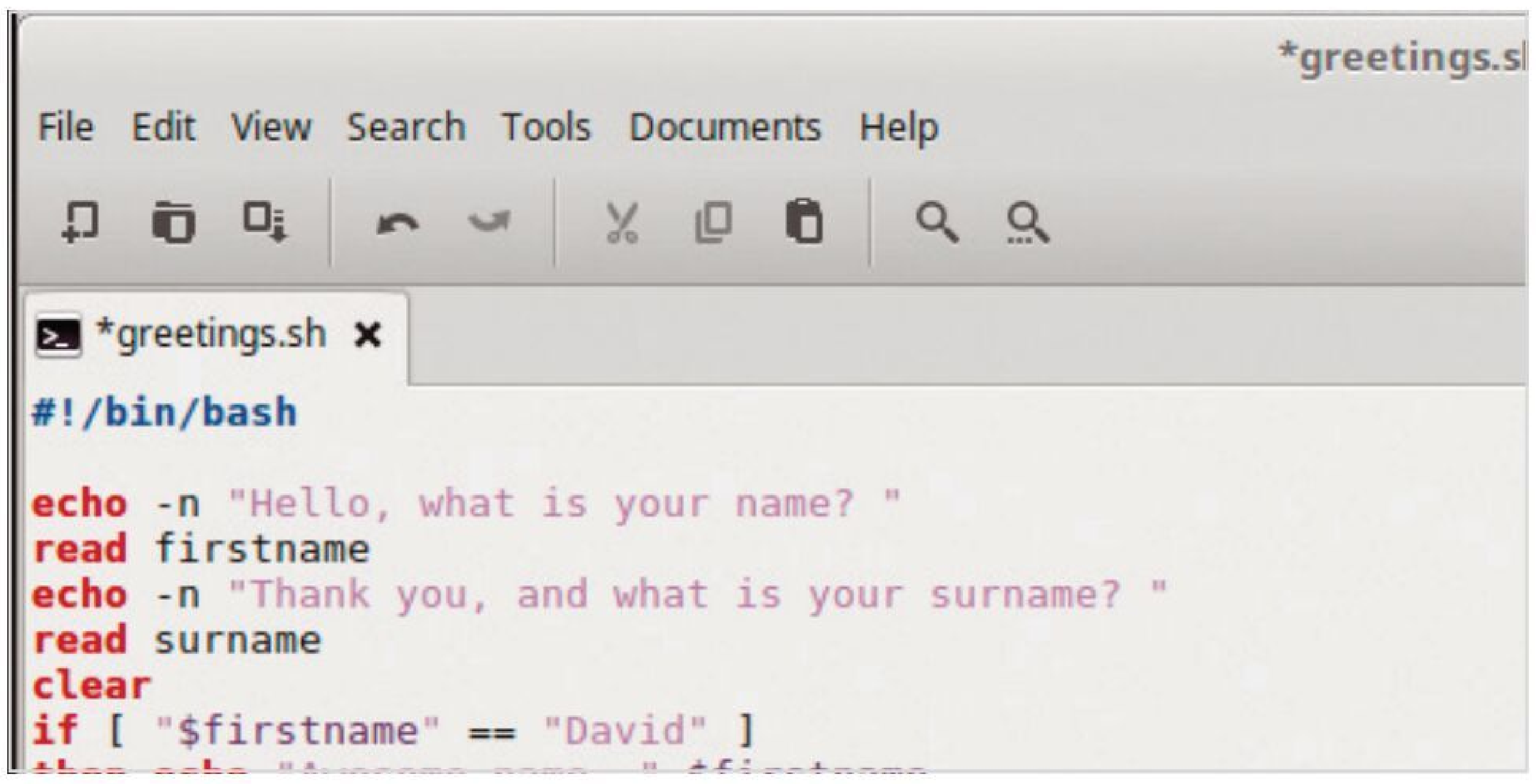
# Creating Bash Scripts – Part 3

In the previous pages we looked at some very basic Bash scripting, which involved outputting text to the screen, getting a user's input, storing it and outputting that to the screen; as well as including a system variable using the Date command. Now let's combine what you've achieved so far and introduce Loops.

## IF, THEN, ELSE

**With most programming structures there will come a time where you need to loop through the commands you've entered to create better functionality, and ultimately a better program.**

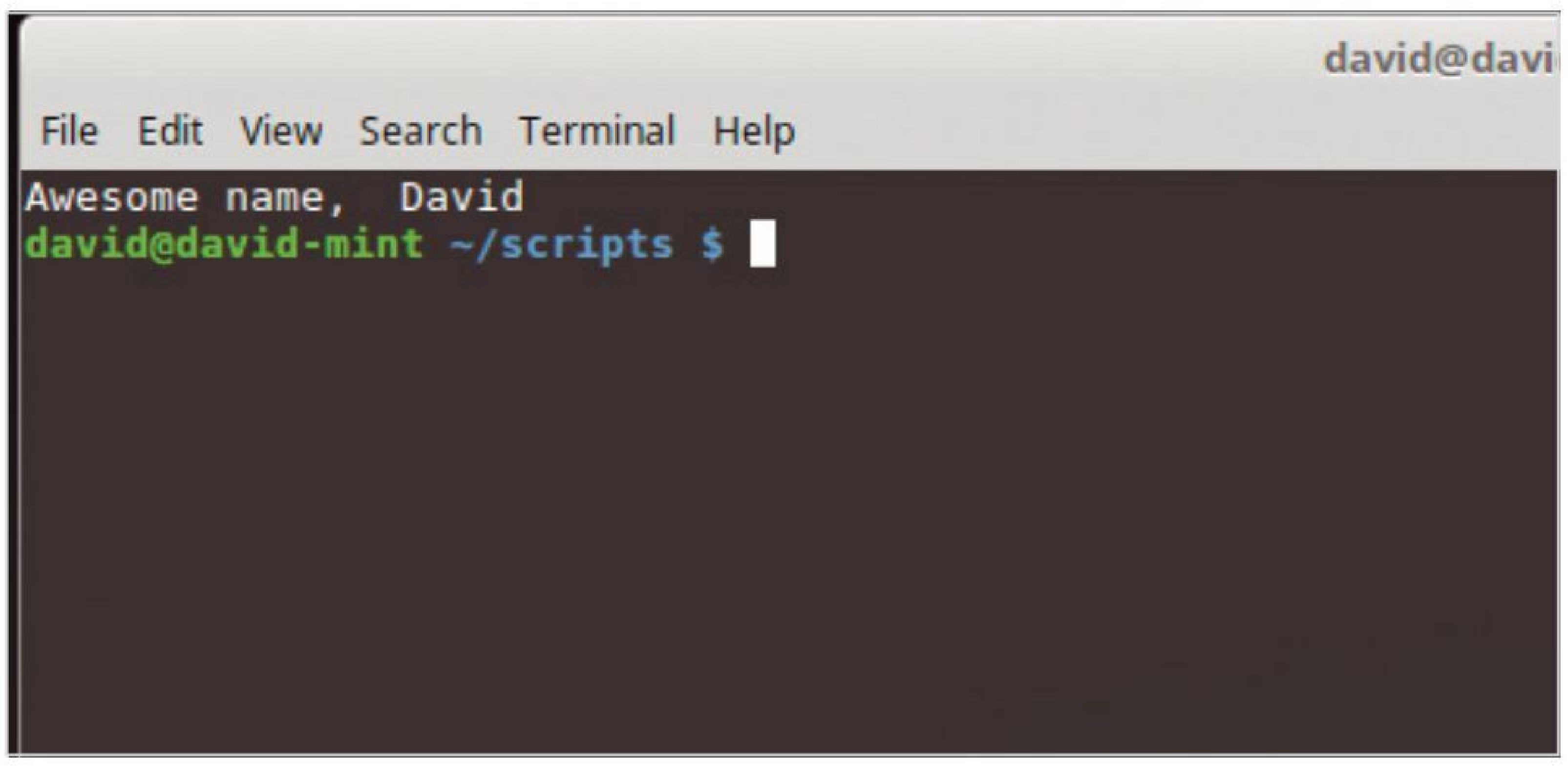
**STEP 1** Let's look at the If, Then and Else statements now, which when executed correctly, compare a set of instructions and simply work out that IF something is present, THEN do something, ELSE do something different. Create a new script called `greeting2.sh` and enter the text in the screenshot below into it.



```
#!/bin/bash

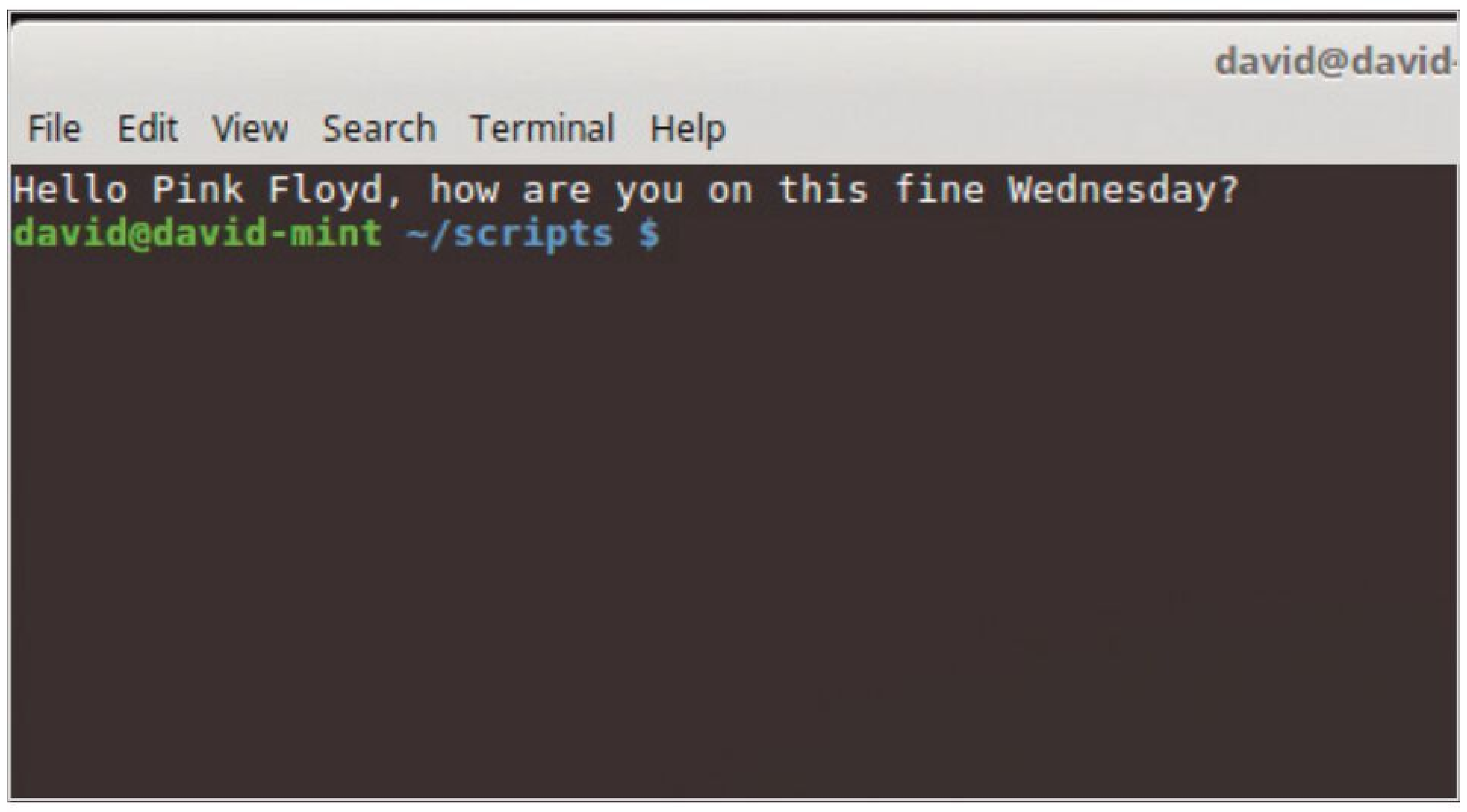
echo -n "Hello, what is your name? "
read firstname
echo -n "Thank you, and what is your surname? "
read surname
clear
if [ "$firstname" == "David" ]
```

**STEP 2** Greeting2.sh is a copy of greeting.sh but with a slight difference. Here we've added a loop starting at the if statement. This means, IF the variable entered is equal to David the next line, THEN, is the reaction to what happens, in this case it will output to the screen 'Awesome name,' followed by the variable (which is David).



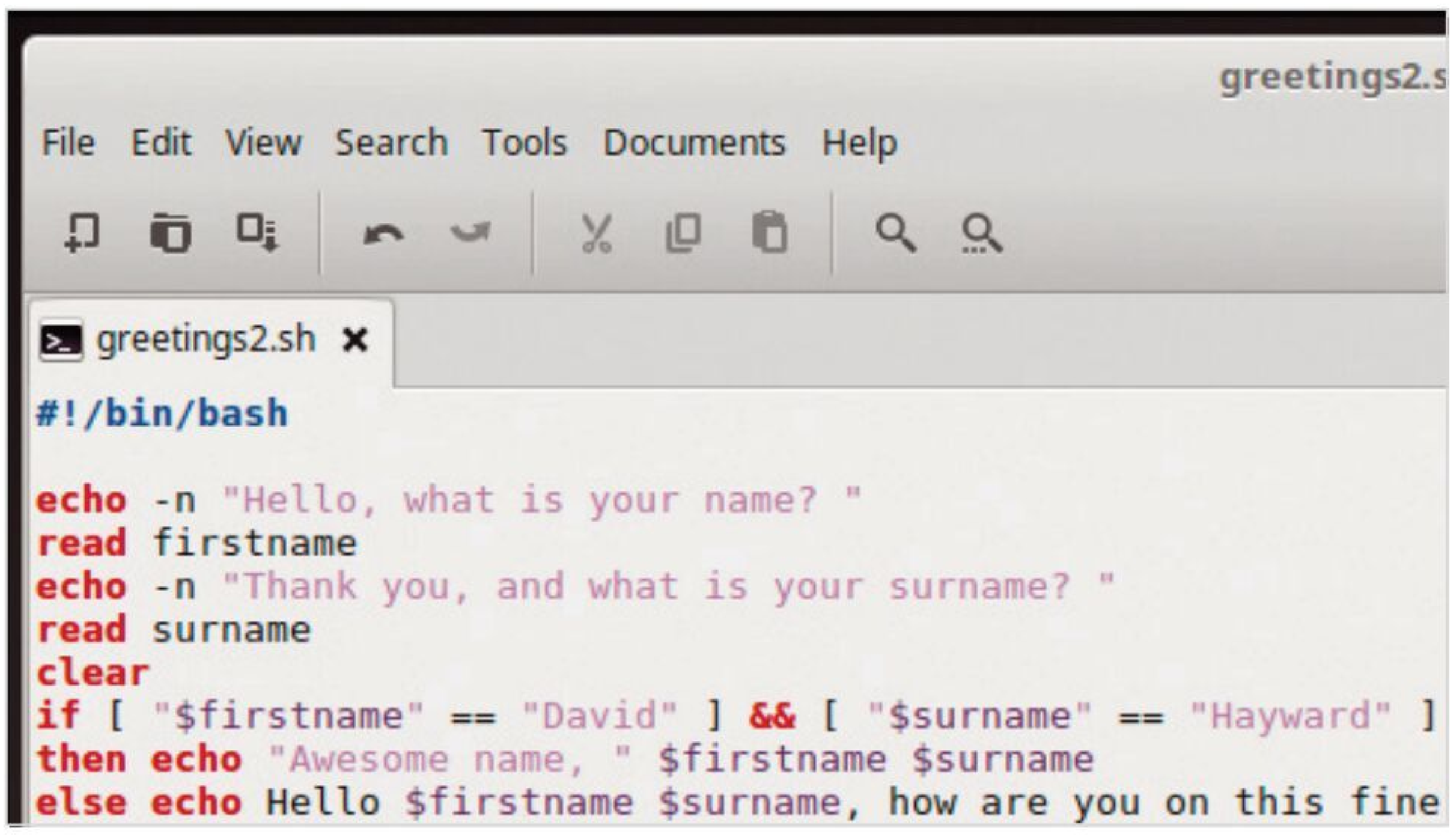
```
Awesome name,  David
david@david-mint ~/scripts $
```

**STEP 3** The next line, ELSE, is what happens if the variable doesn't equal 'David'. In this case it simply outputs to the screen the now familiar 'Hello…'. The last line, the FI statement, is the command that will end the loop. If you have an If command without a Fi command, then you get an error.



```
Hello Pink Floyd, how are you on this fine Wednesday?
david@david-mint ~/scripts $
```

**STEP 4** You can obviously play around with the script a little, changing the name variable that triggers a response; or maybe even issuing a response where the first name and surname variables match a specific variable.



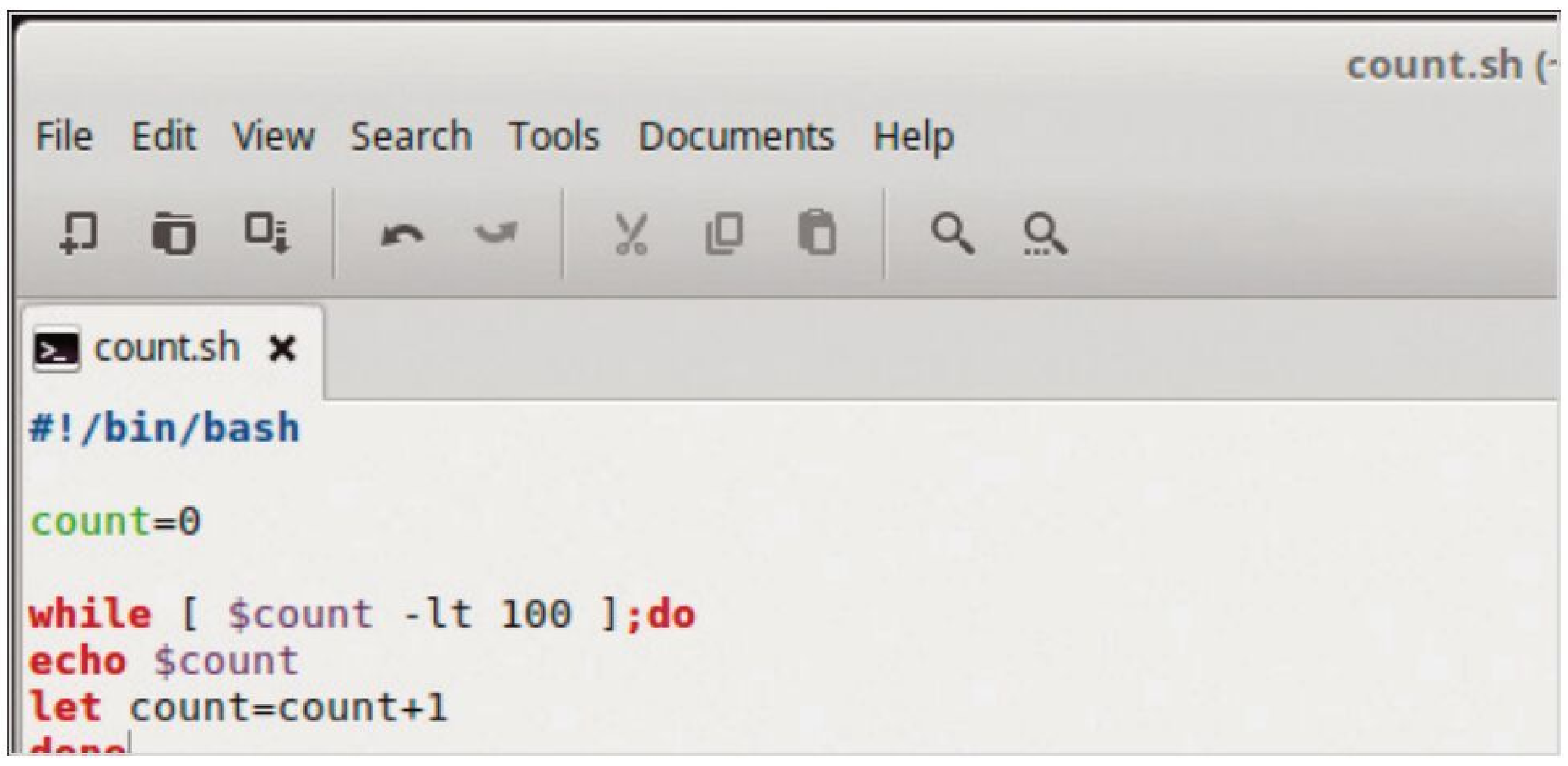
```
#!/bin/bash

echo -n "Hello, what is your name? "
read firstname
echo -n "Thank you, and what is your surname? "
read surname
clear
if [ "$firstname" == "David" ] && [ "$surname" == "Hayward" ]
then echo "Awesome name, " $firstname $surname
else echo Hello $firstname $surname, how are you on this fine
```

## MORE LOOPING

**You can loop over data using the FOR, WHILE and UNTIL statements. These can be handy if you're batch naming, copying or running a script where a counter is needed.**

**STEP 1** Create a new script called `count.sh`. Enter the text in the screenshot below, save it and make it executable. This creates the variable 'count' which at the beginning of the script equals zero. Then start the WHILE loop, which WHILE count is less than (the LT part) 100 will print the current value of count in the echo command.

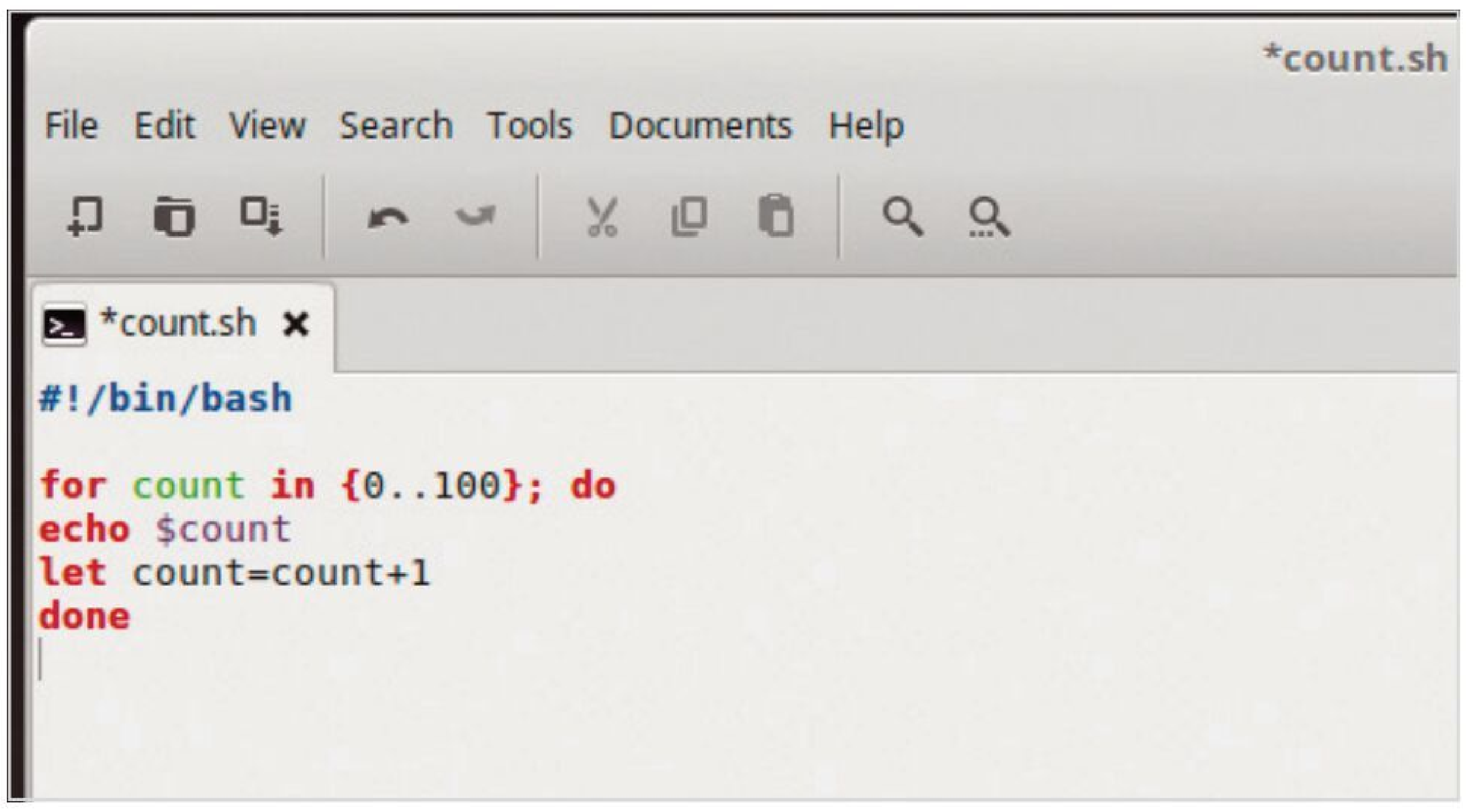

count.sh (-
File Edit View Search Tools Documents Help
count.sh ✕

```
#!/bin/bash

count=0

while [ $count -lt 100 ];do
echo $count
let count=count+1
```

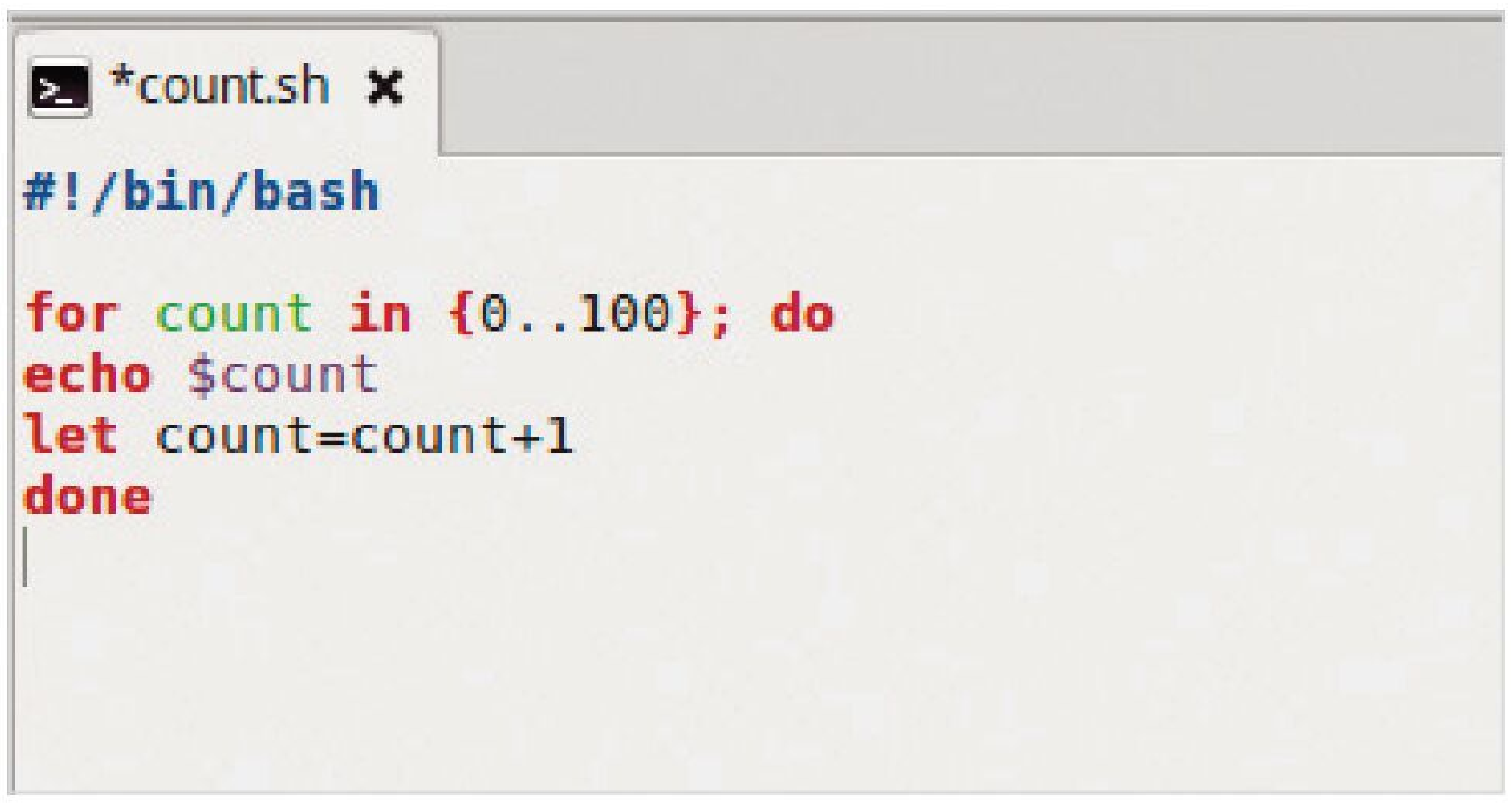
**STEP 2** Executing the count.sh script will result in the numbers 0 to 99 listing down the Terminal screen; when it reaches 100 the script will end. Modifying the script with the FOR statement, makes it work in much the same way. To use it in our script, enter the text from the screenshot into the count.sh script.


*count.sh
File Edit View Search Tools Documents Help
*count.sh ✕

```
#!/bin/bash

for count in {0..100}; do
echo $count
let count=count+1
done
```

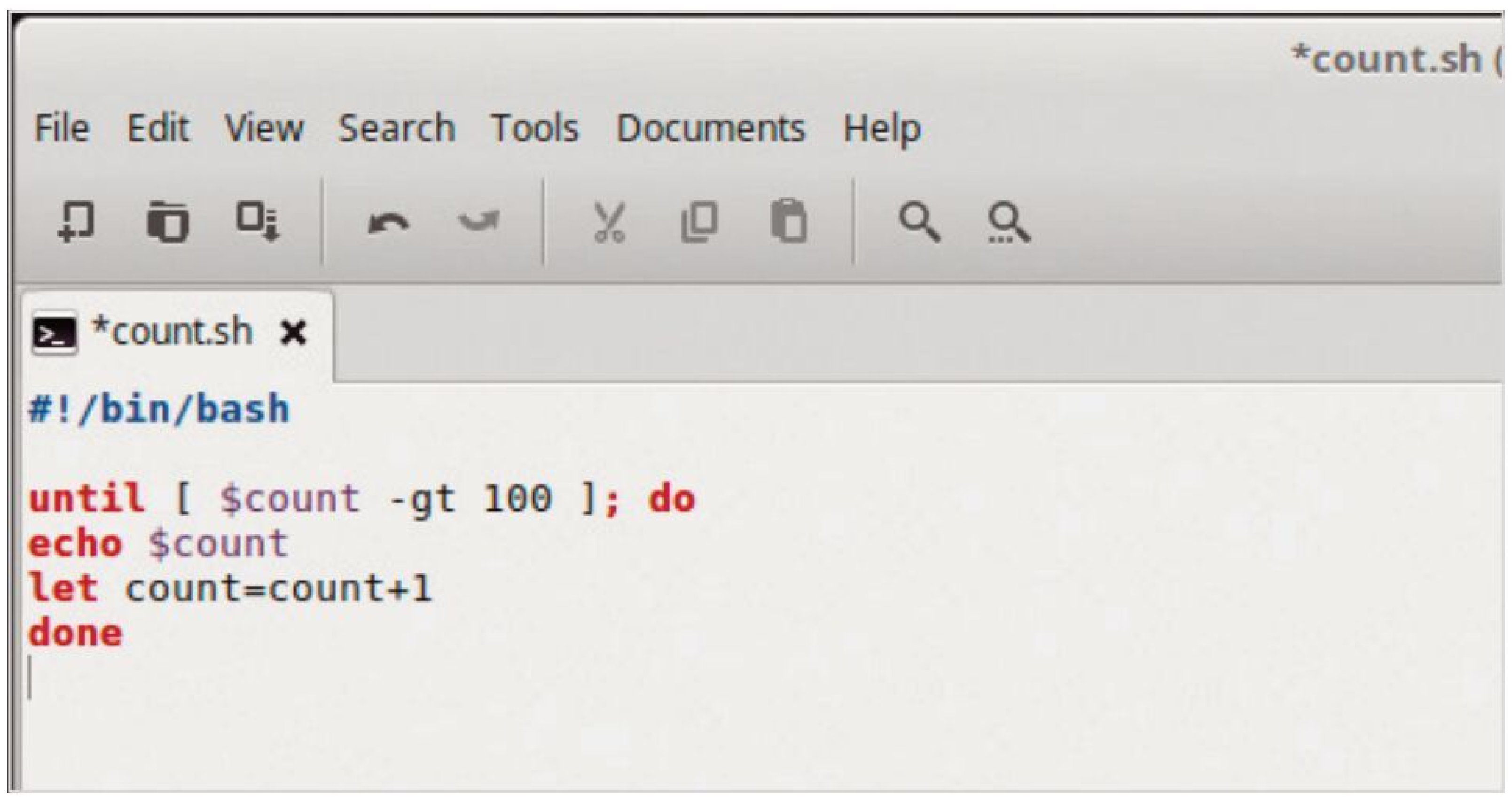
**STEP 3** The addition we have here is: `for count in {0..100}; do`. Which means: FOR the variable 'count' IN the numbers from zero to one hundred, then start the loop. The rest of the script is the same. Run this script, and the same output should appear in the Terminal.



```
#!/bin/bash

for count in {0..100}; do
echo $count
let count=count+1
done
```

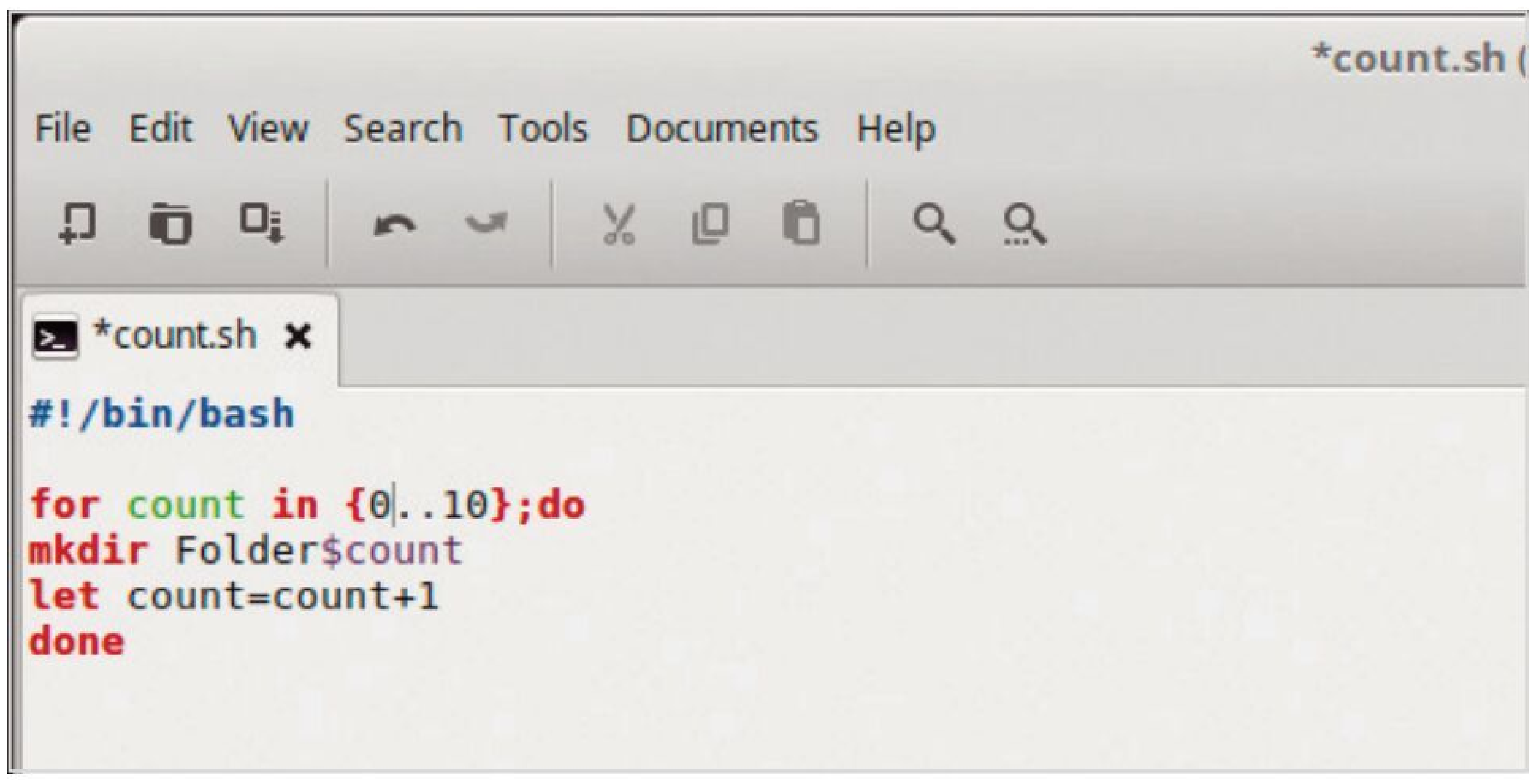
**STEP 4** The UNTIL loop works much the same way as the WHILE loop only, more often than not, in reverse. So our counting to a hundred, using `UNTIL, would be: until [ $count -gt 100 ]; do`. The difference being, UNTIL count is greater than (the gt part) one hundred, keep on looping.


*count.sh (
File Edit View Search Tools Documents Help
*count.sh ✕

```
#!/bin/bash

until [ $count -gt 100 ]; do
echo $count
let count=count+1
done
```

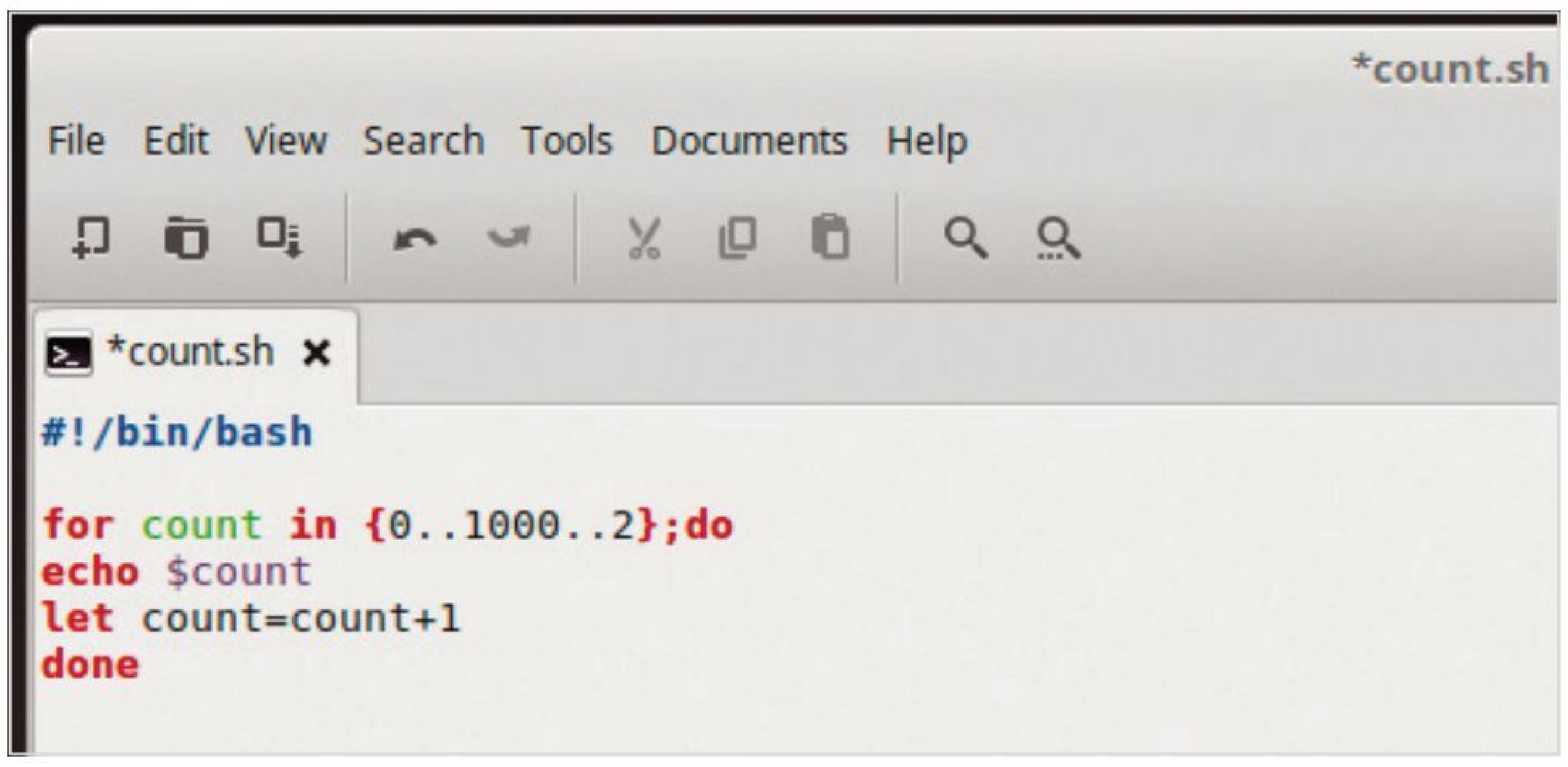
**STEP 5** You're not limited to numbers zero to one hundred. You can, within the loop, have whatever set of commands you like and execute them as many times as you want the loop to run for. Renaming a million files, creating fifty folders etc. For example, this script will create ten folders named folder1 through to folder10 using the FOR loop.


*count.sh (
File Edit View Search Tools Documents Help
*count.sh ✕

```
#!/bin/bash

for count in {0..10};do
mkdir Folder$count
let count=count+1
done
```

**STEP 6** Using the FOR statement once more, we can execute the counting sequence by manipulating the {0..100} part. This section of the code actually means {START..END..INCREMENT}, if there's no increment then it's just a single digit up to the END. For example, we could get the loops to count up to 1000 in two's with: `for count in {0..1000..2}; do`.


*count.sh
File Edit View Search Tools Documents Help
*count.sh ✕

```
#!/bin/bash

for count in {0..1000..2};do
echo $count
let count=count+1
done
```

# Creating Bash Scripts – Part 4

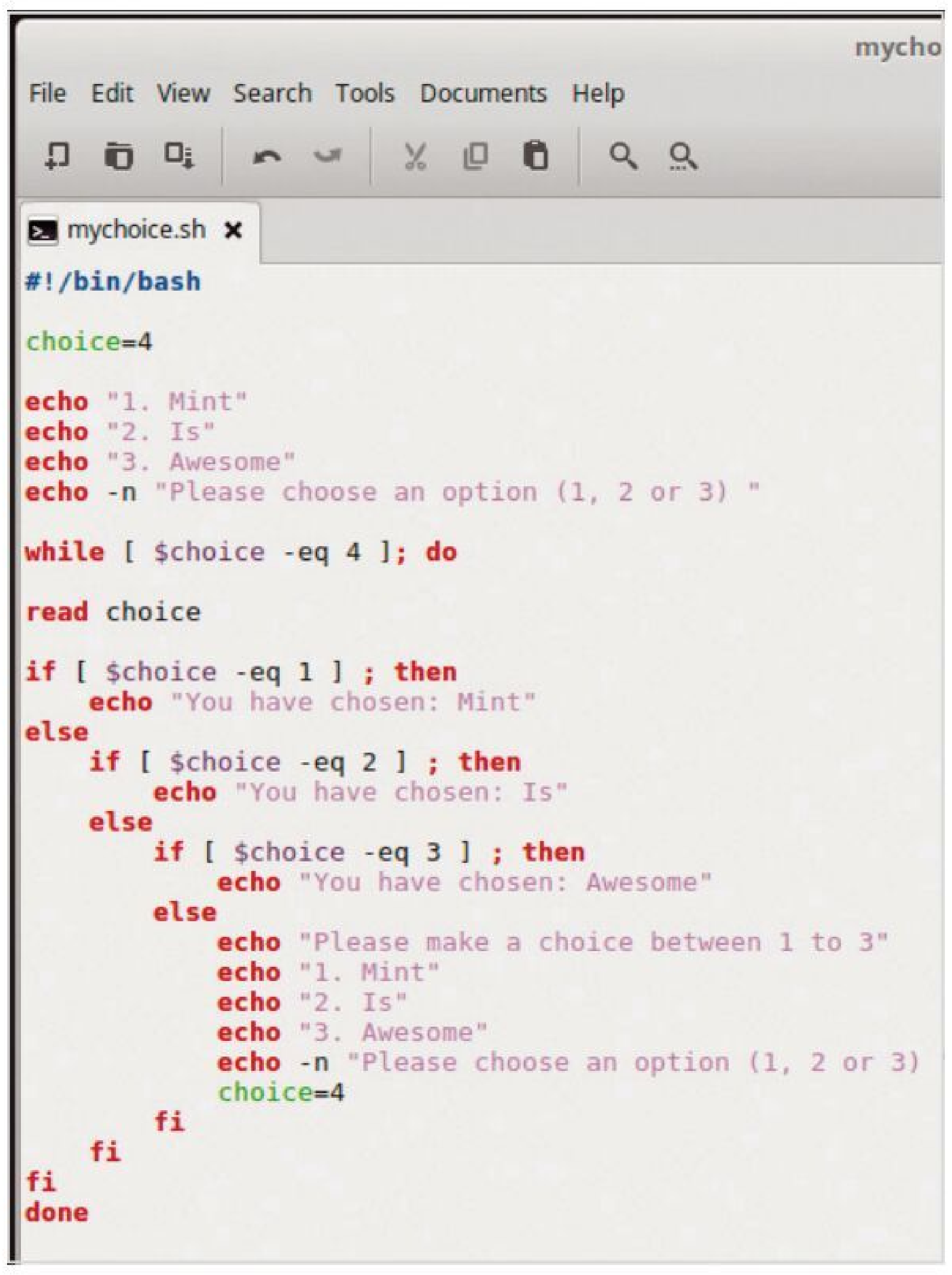
You've encountered user interaction with your scripts, asking what the user's name is and so on. You've also looked at creating loops within the script to either count or simply do something several times. Let's combine and expand some more.

## CHOICES AND LOOPS

**Let's bring in another command, CHOICE, along with some nested IF and ELSE statements. Start by creating a new script called `mychoice.sh`.**

### STEP 1

The mychoice.sh script is beginning to look a lot more complex. What we have here is a list of four choices, with three possible options. The options: Mint, Is, and Awesome will be displayed if the user presses the correct option key. If not, then the menu will reappear, the fourth choice.



```
#!/bin/bash

choice=4

echo "1. Mint"
echo "2. Is"
echo "3. Awesome"
echo -n "Please choose an option (1, 2 or 3) "

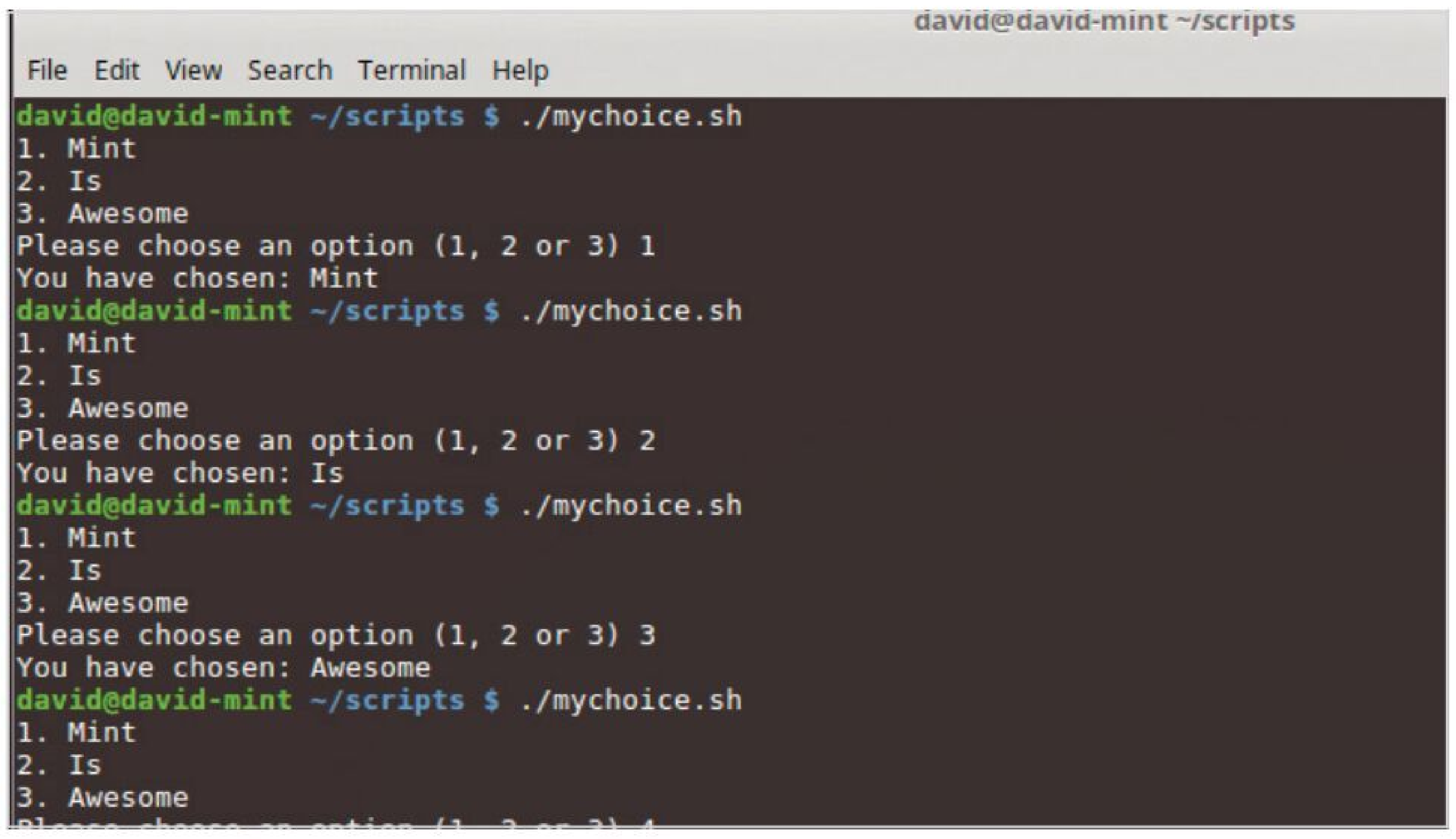
while [ $choice -eq 4 ]; do

read choice

if [ $choice -eq 1 ] ; then
    echo "You have chosen: Mint"
else
    if [ $choice -eq 2 ] ; then
        echo "You have chosen: Is"
    else
        if [ $choice -eq 3 ] ; then
            echo "You have chosen: Awesome"
        else
            echo "Please make a choice between 1 to 3"
            echo "1. Mint"
            echo "2. Is"
            echo "3. Awesome"
            echo -n "Please choose an option (1, 2 or 3)
            choice=4
        fi
    fi
fi
done
```

### STEP 2

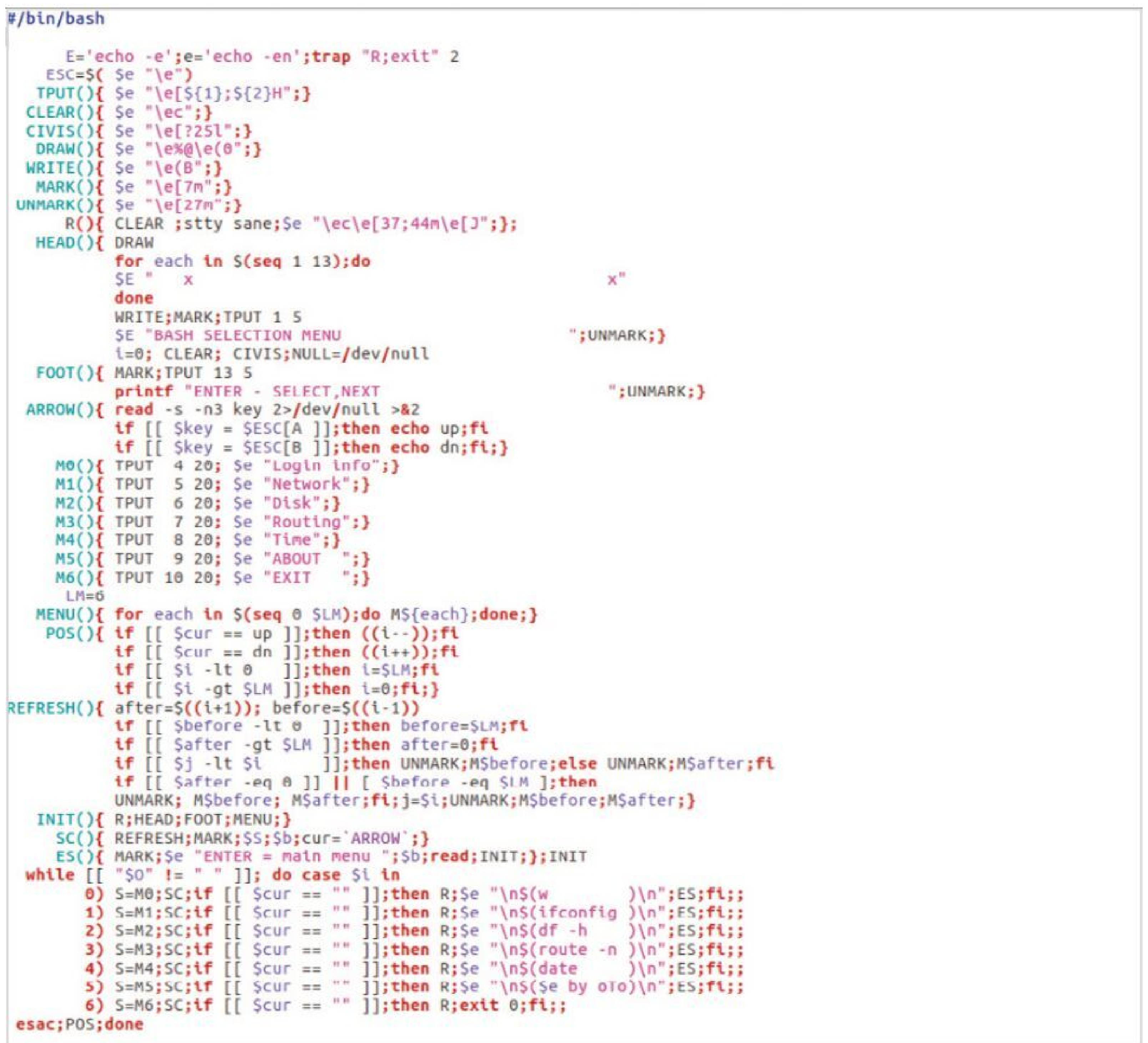
If you follow the script through you soon get the hang of what's going on, based on what we've already covered. WHILE, IF, and ELSE, with the FI closing loop statement will run through the options and bring you back to the start if you pick the wrong option.


david@david-mint ~/scripts
File Edit View Search Terminal Help

```
david@david-mint ~/scripts $ ./mychoice.sh
1. Mint
2. Is
3. Awesome
Please choose an option (1, 2 or 3) 1
You have chosen: Mint
david@david-mint ~/scripts $ ./mychoice.sh
1. Mint
2. Is
3. Awesome
Please choose an option (1, 2 or 3) 2
You have chosen: Is
david@david-mint ~/scripts $ ./mychoice.sh
1. Mint
2. Is
3. Awesome
Please choose an option (1, 2 or 3) 3
You have chosen: Awesome
david@david-mint ~/scripts $ ./mychoice.sh
1. Mint
2. Is
3. Awesome
```

### STEP 3

You can, of course, increase the number of choices but you need to make sure that you match the number of choices to the number of IF statements. The script can quickly become a very busy screen to look at. This lengthy script is another way of displaying a menu, this time with a fancy colour scheme too.

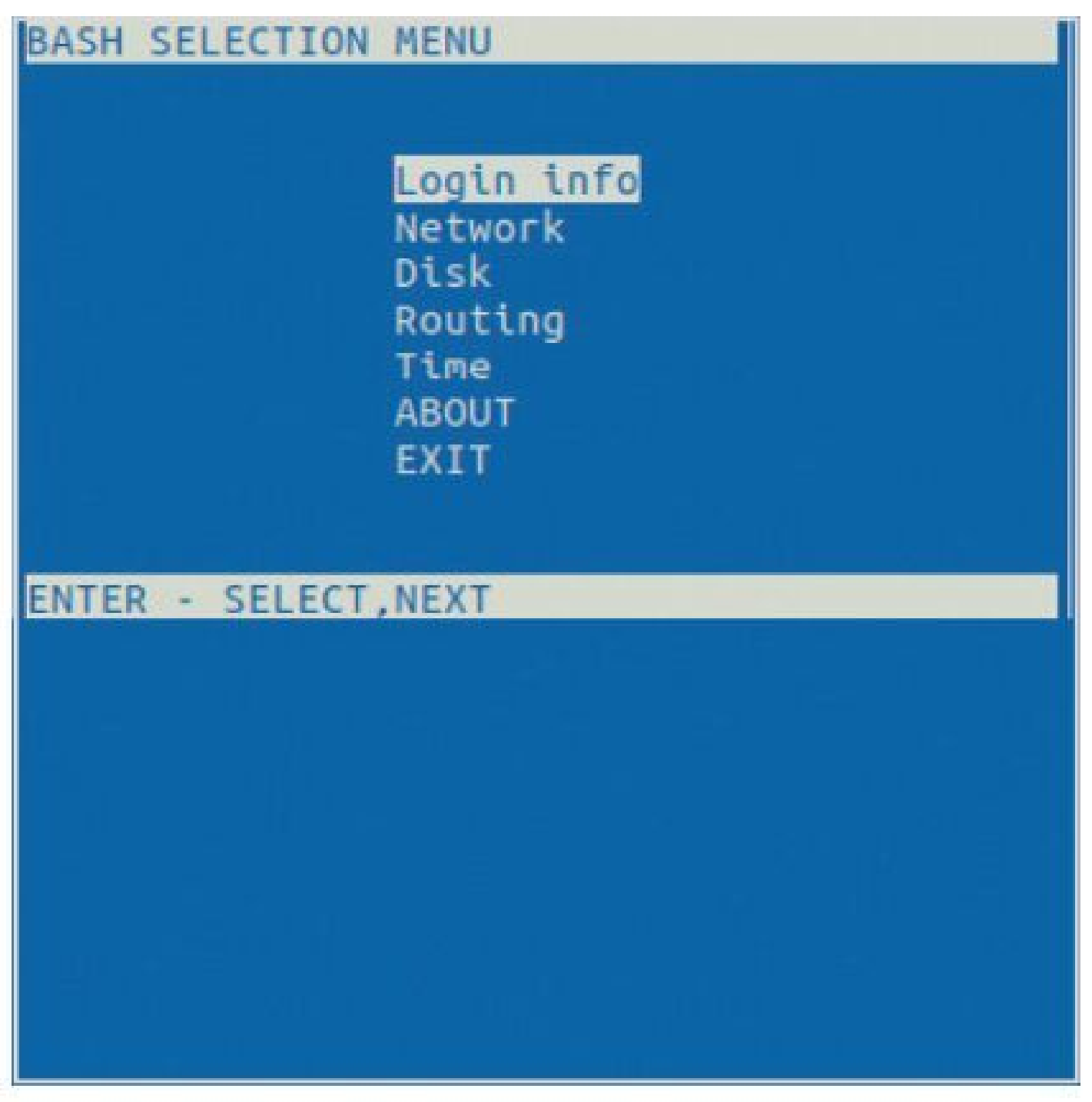


```
#/bin/bash

      E='echo -e';e='echo -en';trap "R;exit" 2
    ESC=$( $e "\e")
   TPUT(){ $e "\e[${1};${2}H";}
  CLEAR(){ $e "\ec";}
  CIVIS(){ $e "\e[?25l";}
   DRAW(){ $e "\e%@\e(0";}
  WRITE(){ $e "\e(B";}
   MARK(){ $e "\e[7m";}
 UNMARK(){ $e "\e[27m";}
      R(){ CLEAR ;stty sane;$e "\ec\e[37;44m\e[J";};
   HEAD(){ DRAW
           for each in $(seq 1 13);do
           $E "   x                                        x"
           done
           WRITE;MARK;TPUT 1 5
           $E "BASH SELECTION MENU                       ";UNMARK;}
           i=0; CLEAR; CIVIS;NULL=/dev/null
   FOOT(){ MARK;TPUT 13 5
           printf "ENTER - SELECT,NEXT                       ";UNMARK;}
  ARROW(){ read -s -n3 key 2>/dev/null >&2
           if [[ $key = $ESC[A ]];then echo up;fi
           if [[ $key = $ESC[B ]];then echo dn;fi;}
     M0(){ TPUT  4 20; $e "Login info";}
     M1(){ TPUT  5 20; $e "Network";}
     M2(){ TPUT  6 20; $e "Disk";}
     M3(){ TPUT  7 20; $e "Routing";}
     M4(){ TPUT  8 20; $e "Time";}
     M5(){ TPUT  9 20; $e "ABOUT  ";}
     M6(){ TPUT 10 20; $e "EXIT   ";}
      LM=6
   MENU(){ for each in $(seq 0 $LM);do M${each};done;}
    POS(){ if [[ $cur == up ]];then ((i--));fi
           if [[ $cur == dn ]];then ((i++));fi
           if [[ $i -lt 0   ]];then i=$LM;fi
           if [[ $i -gt $LM ]];then i=0;fi;}
REFRESH(){ after=$((i+1)); before=$((i-1))
           if [[ $before -lt 0  ]];then before=$LM;fi
           if [[ $after -gt $LM ]];then after=0;fi
           if [[ $j -lt $i      ]];then UNMARK;M$before;else UNMARK;M$after;fi
           if [[ $after -eq 0 ]] || [ $before -eq $LM ];then
           UNMARK; M$before; M$after;fi;j=$i;UNMARK;M$before;M$after;}
   INIT(){ R;HEAD;FOOT;MENU;}
     SC(){ REFRESH;MARK;$S;$b;cur=`ARROW`;}
     ES(){ MARK;$e "ENTER = main menu ";$b;read;INIT;};INIT
  while [[ "$O" != " " ]]; do case $i in
        0) S=M0;SC;if [[ $cur == "" ]];then R;$e "\n$(w        )\n";ES;fi;;
        1) S=M1;SC;if [[ $cur == "" ]];then R;$e "\n$(ifconfig )\n";ES;fi;;
        2) S=M2;SC;if [[ $cur == "" ]];then R;$e "\n$(df -h    )\n";ES;fi;;
        3) S=M3;SC;if [[ $cur == "" ]];then R;$e "\n$(route -n )\n";ES;fi;;
        4) S=M4;SC;if [[ $cur == "" ]];then R;$e "\n$(date     )\n";ES;fi;;
        5) S=M5;SC;if [[ $cur == "" ]];then R;$e "\n$($e by oTo)\n";ES;fi;;
        6) S=M6;SC;if [[ $cur == "" ]];then R;exit 0;fi;;
 esac;POS;done
```

### STEP 4

You can use the arrow keys and Enter in the menu setup in the script. Each choice is an external command that feeds back various information. Play around with the commands and choices, and see what you can come up with. It's a bit beyond what we've looked at but it gives a good idea of what can be achieved.



```
BASH SELECTION MENU

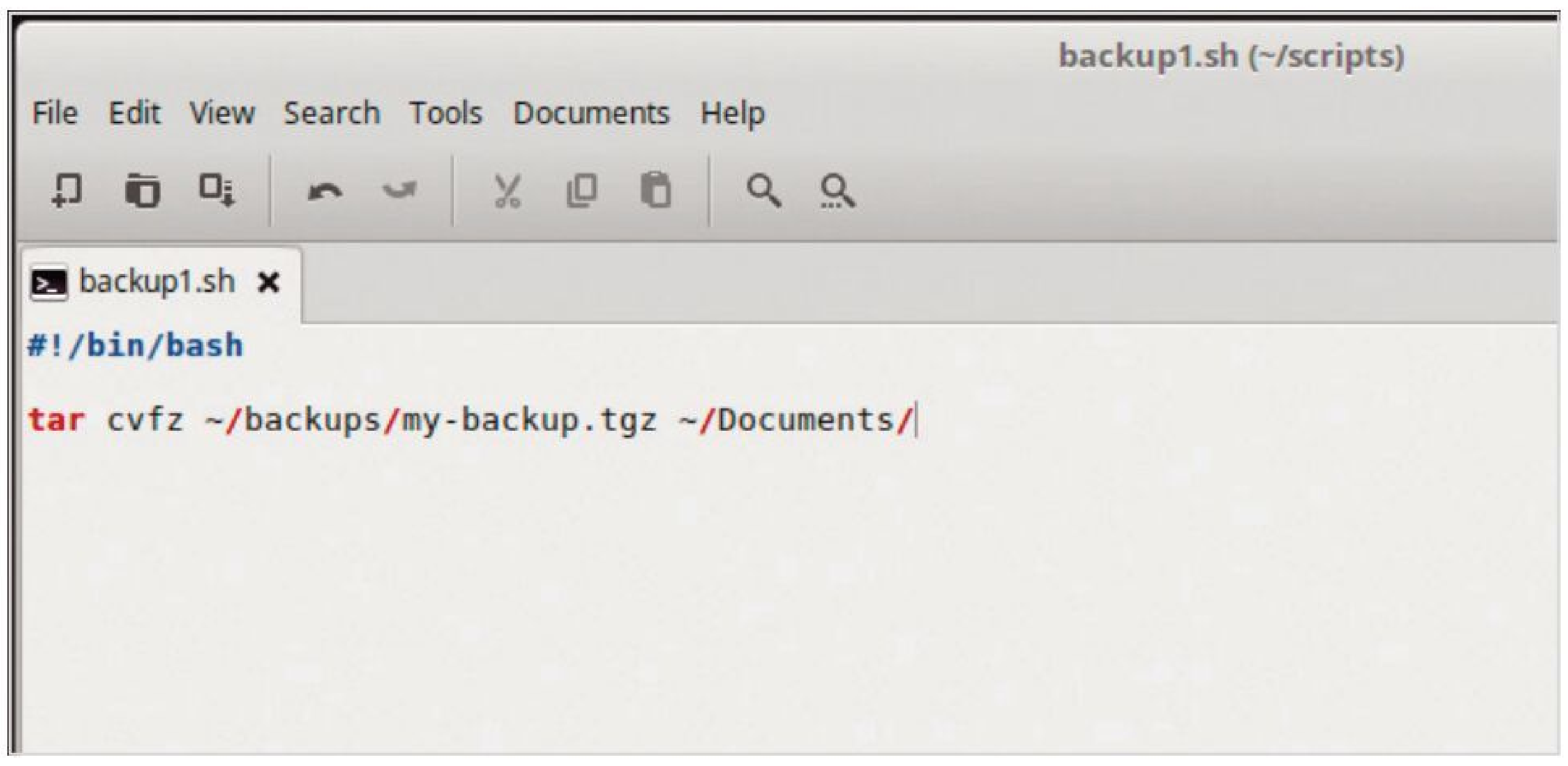
             Login info
             Network
             Disk
             Routing
             Time
             ABOUT
             EXIT

ENTER - SELECT,NEXT
```

## CREATING A BACKUP TASK SCRIPT

**One of the most well used examples of Bash scripting is the creation of a backup routine, one that automates the task as well as adding some customisations along the way.**

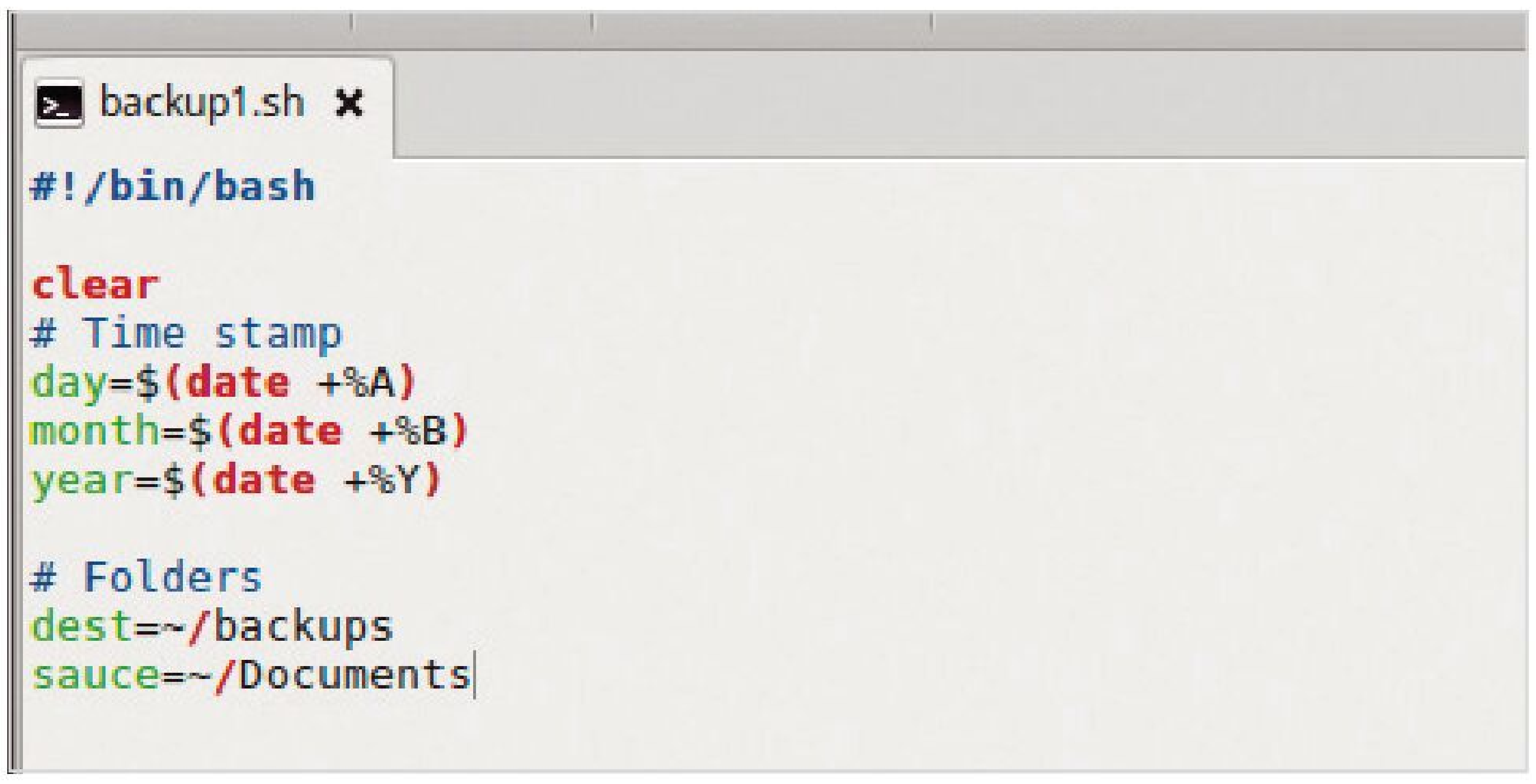
**STEP 1** A very basic backup script would look something along the lines of: `#!/bin/bash, then, tar cvfz ~/backups/my-backup.tgz ~/Documents/`. This will create a compressed file backup of the ~/Documents folder, with everything in it, and put it in a folder called /backups with the name my-backup.tgz.



```
#!/bin/bash

tar cvfz ~/backups/my-backup.tgz ~/Documents/
```

**STEP 2** While perfectly fine, we can make the simple script a lot more interactive. Let's begin with defining some variables. Enter the text in the screenshot into a new backup.sh script. Notice that we've misspelt 'source' as 'sauce', this is because there's already a built-in command called 'source' hence the different spelling on our part.

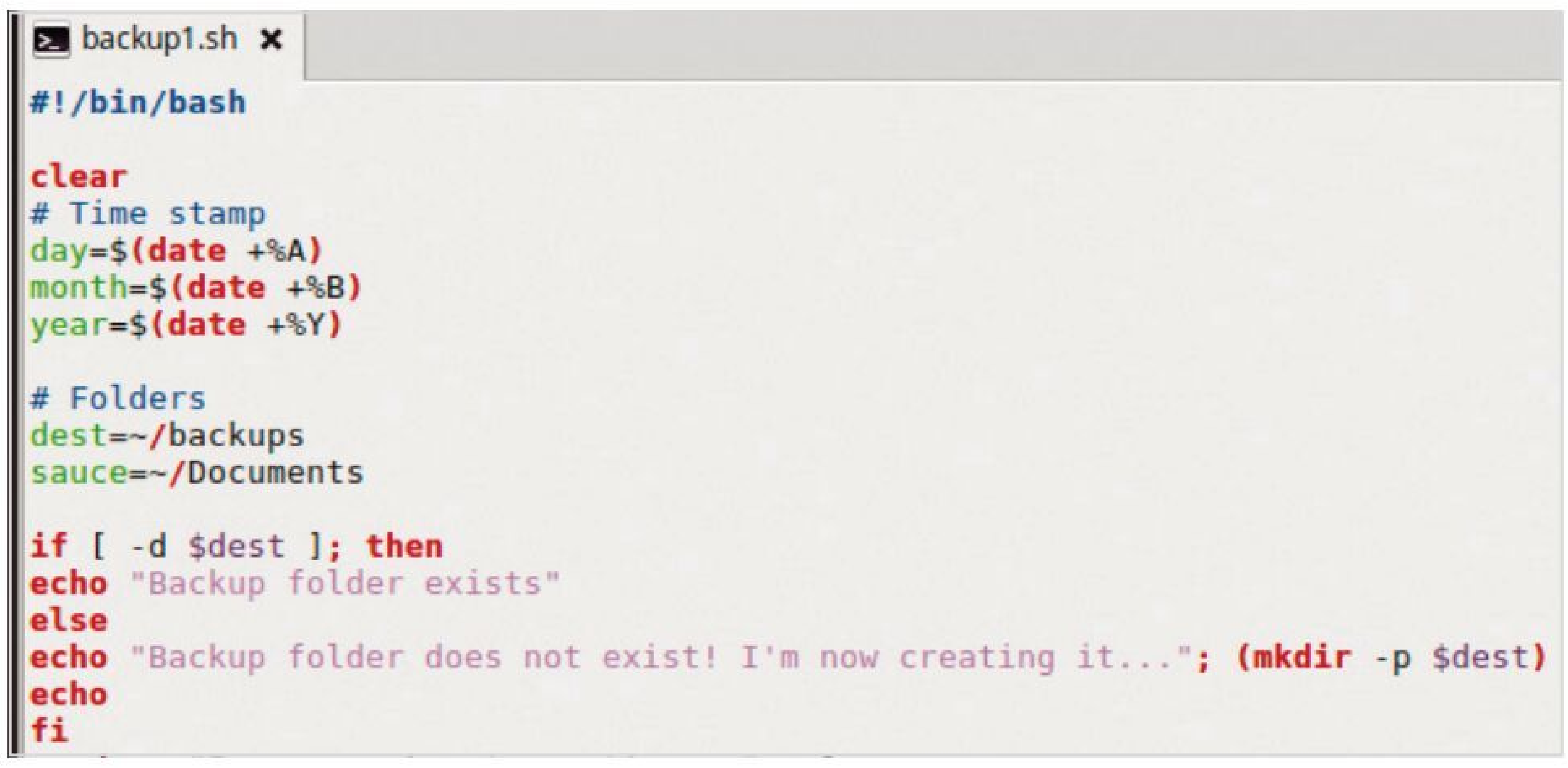


```
#!/bin/bash

clear
# Time stamp
day=$(date +%A)
month=$(date +%B)
year=$(date +%Y)

# Folders
dest=~/backups
sauce=~/Documents
```

**STEP 3** The previous script entries allowed you to create a Time Stamp, so you know when the backup was taken. You also created a 'dest' variable, which is the folder where the backup file will be created (~/backups). You can now add a section of code to first check if the ~/backups folder exits, if not, then it creates one.



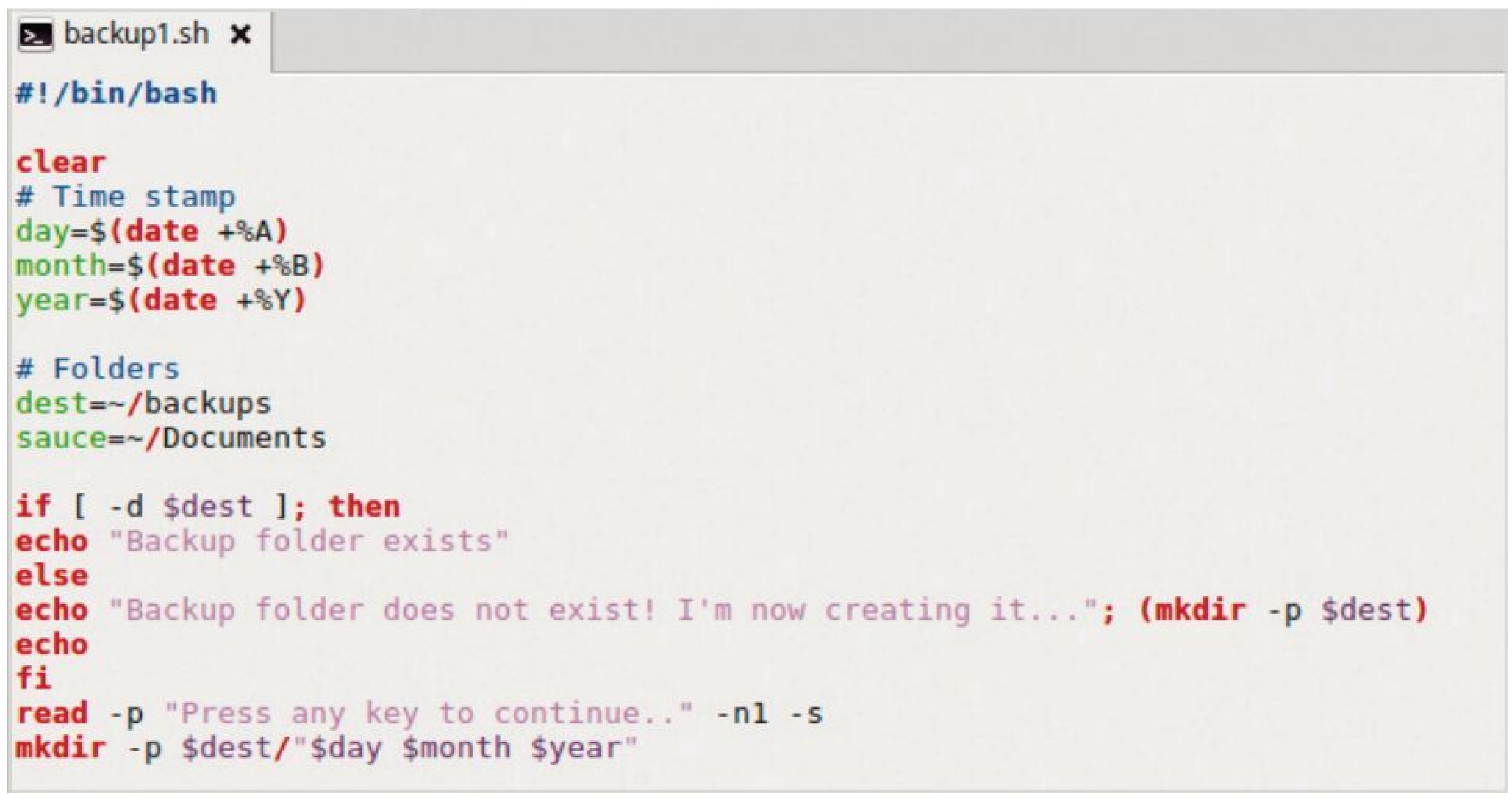
```
#!/bin/bash

clear
# Time stamp
day=$(date +%A)
month=$(date +%B)
year=$(date +%Y)

# Folders
dest=~/backups
sauce=~/Documents

if [ -d $dest ]; then
echo "Backup folder exists"
else
echo "Backup folder does not exist! I'm now creating it..."; (mkdir -p $dest)
echo
fi
```

**STEP 4** Once the ~/backups folder is created, we can now create a new subfolder within it based on the Time Stamp variables you set up at the beginning. Add `mkdir -p $dest/"$day $month $year"`. It's in here that you put the backup file relevant to that day/month/year.



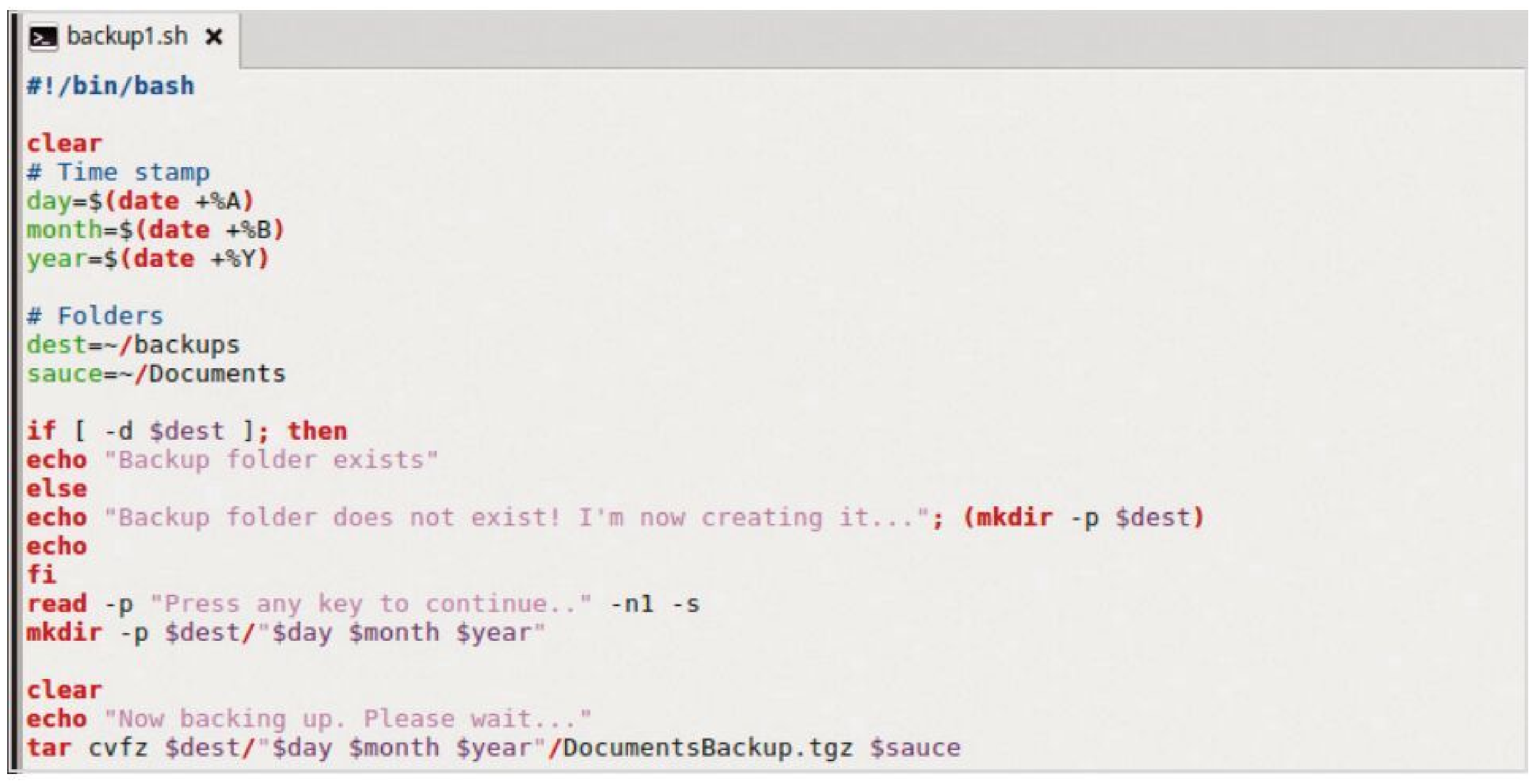
```
#!/bin/bash

clear
# Time stamp
day=$(date +%A)
month=$(date +%B)
year=$(date +%Y)

# Folders
dest=~/backups
sauce=~/Documents

if [ -d $dest ]; then
echo "Backup folder exists"
else
echo "Backup folder does not exist! I'm now creating it..."; (mkdir -p $dest)
echo
fi
read -p "Press any key to continue.." -n1 -s
mkdir -p $dest/"$day $month $year"
```

**STEP 5** With everything in place, you can now enter the actual backup routine, based on the Tar command from Step 5. Combined with the variables, you have: `tar cvfz $dest/"$day $month $year"/DocumentsBackup.tgz $sauce`. In the screenshot, we added a handy "Now backing up..." echo command.



```
#!/bin/bash

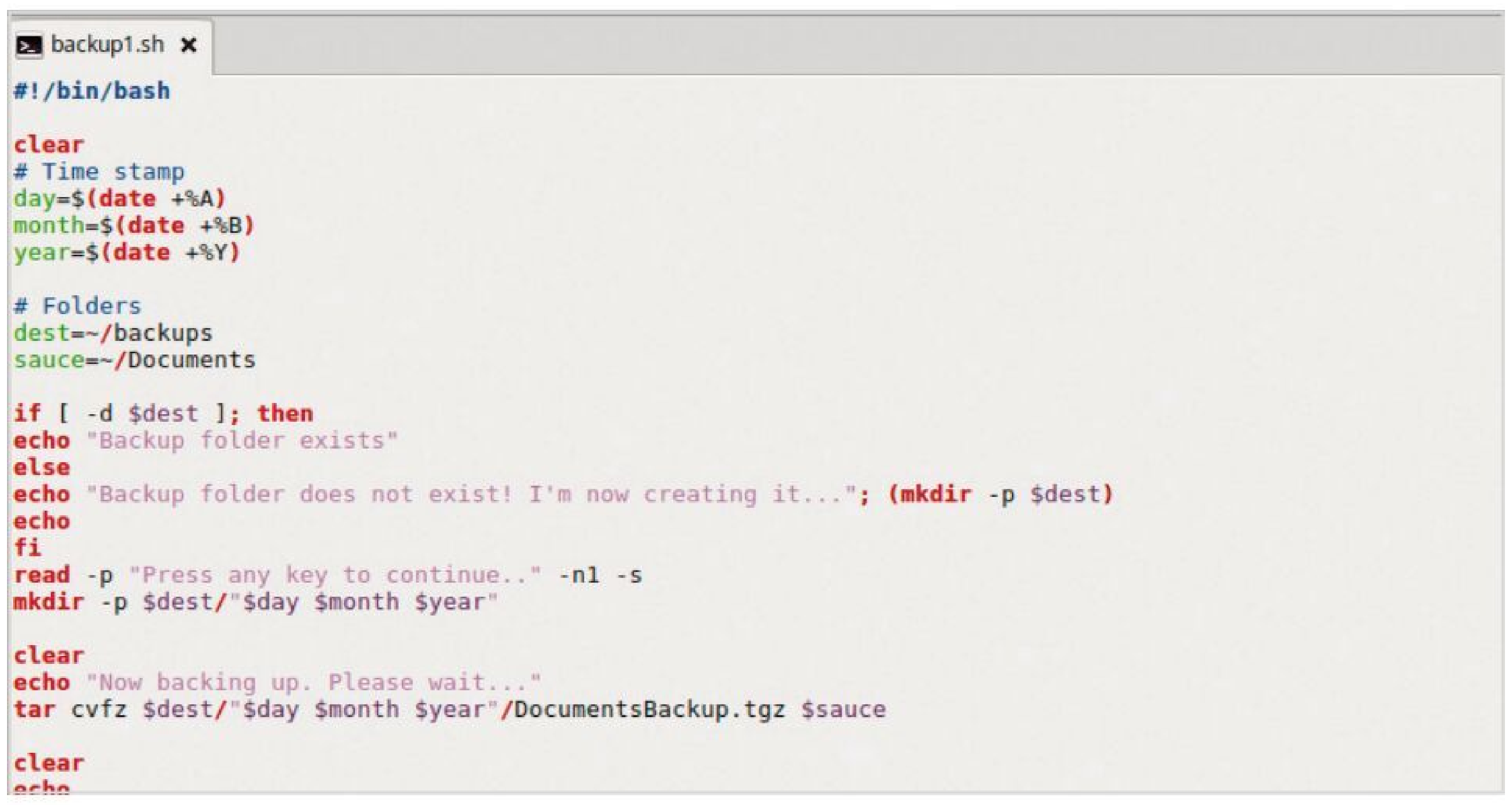
clear
# Time stamp
day=$(date +%A)
month=$(date +%B)
year=$(date +%Y)

# Folders
dest=~/backups
sauce=~/Documents

if [ -d $dest ]; then
echo "Backup folder exists"
else
echo "Backup folder does not exist! I'm now creating it..."; (mkdir -p $dest)
echo
fi
read -p "Press any key to continue.." -n1 -s
mkdir -p $dest/"$day $month $year"

clear
echo "Now backing up. Please wait..."
tar cvfz $dest/"$day $month $year"/DocumentsBackup.tgz $sauce
```

**STEP 6** Finally, you can add a friendly message: `echo "Backup complete. All done..."`. The completed script isn't too over-complex and it can be easily customised to include any folder within your Home area, as well as the entire Home area itself.



```
#!/bin/bash

clear
# Time stamp
day=$(date +%A)
month=$(date +%B)
year=$(date +%Y)

# Folders
dest=~/backups
sauce=~/Documents

if [ -d $dest ]; then
echo "Backup folder exists"
else
echo "Backup folder does not exist! I'm now creating it..."; (mkdir -p $dest)
echo
fi
read -p "Press any key to continue.." -n1 -s
mkdir -p $dest/"$day $month $year"

clear
echo "Now backing up. Please wait..."
tar cvfz $dest/"$day $month $year"/DocumentsBackup.tgz $sauce

clear
echo
```

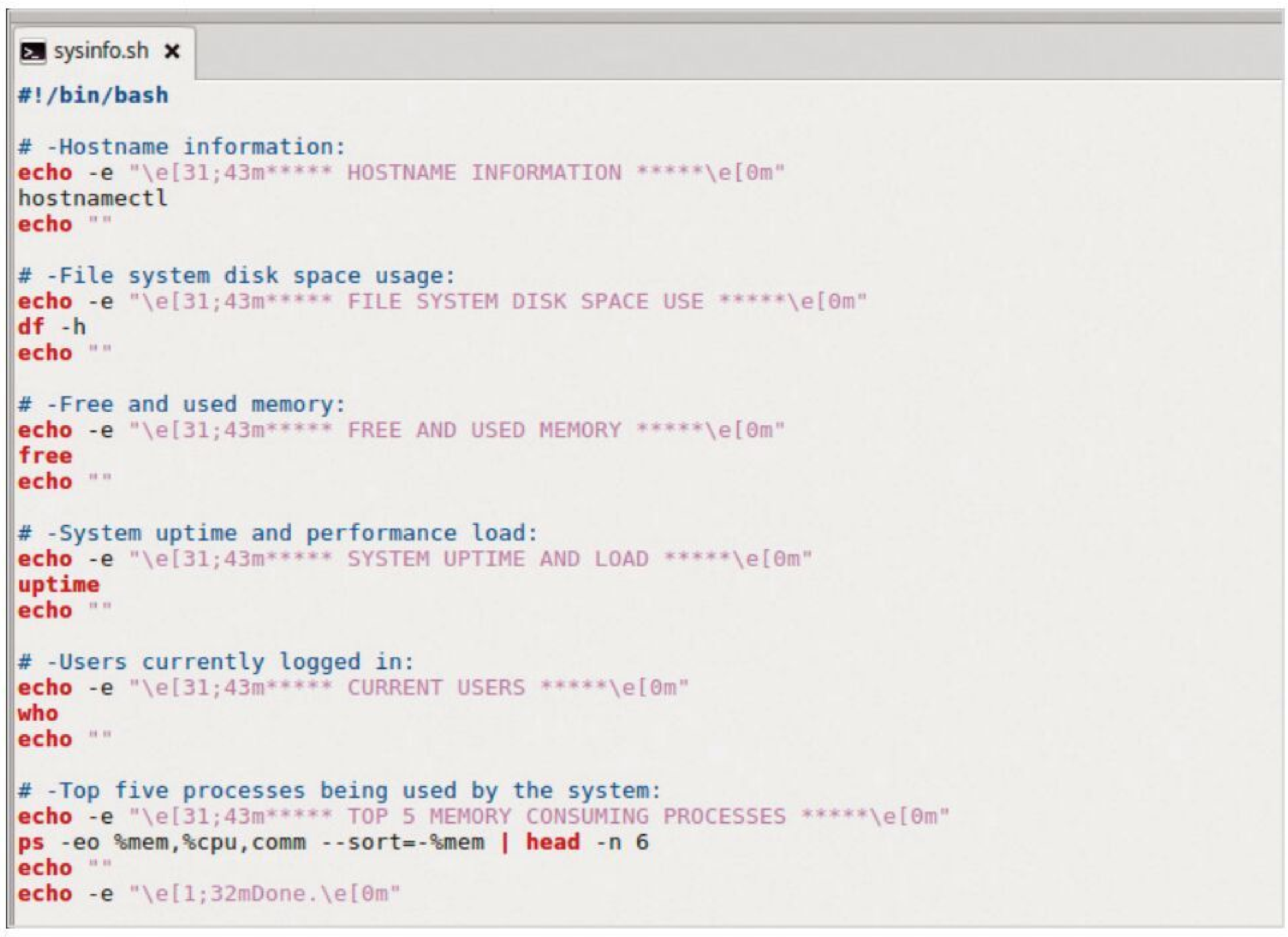
# Creating Bash Scripts – Part 5

The backup script we looked at previously can be further amended to incorporate choices, user-interaction with regards to where the backup file will be copied to and so on. Automating tasks is one of the main benefits of Bash scripting, a simple script can help you out in many ways.

## EASY AUTOMATION AND HANDY SCRIPTS

**Entering line after line of commands to retrieve system information, find a file or rename a batch of files? A script is a better answer.**

**STEP 1** Let's start by creating a script to help display the Mint system information; always a handy thing to have. Create a new script called `sysinfo.sh` and enter the following into Xed, or the text editor of your choice.



```
#!/bin/bash

# -Hostname information:
echo -e "\e[31;43m***** HOSTNAME INFORMATION *****\e[0m"
hostnamectl
echo ""

# -File system disk space usage:
echo -e "\e[31;43m***** FILE SYSTEM DISK SPACE USE *****\e[0m"
df -h
echo ""

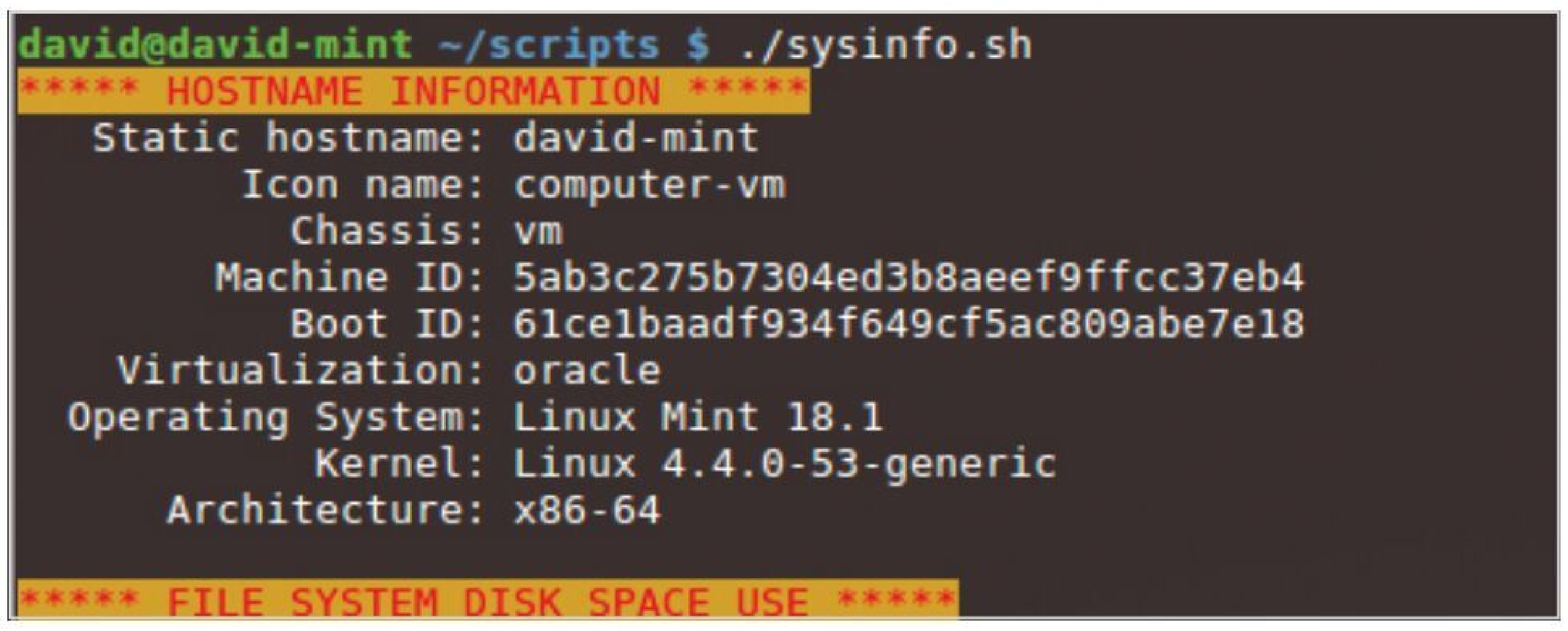
# -Free and used memory:
echo -e "\e[31;43m***** FREE AND USED MEMORY *****\e[0m"
free
echo ""

# -System uptime and performance load:
echo -e "\e[31;43m***** SYSTEM UPTIME AND LOAD *****\e[0m"
uptime
echo ""

# -Users currently logged in:
echo -e "\e[31;43m***** CURRENT USERS *****\e[0m"
who
echo ""

# -Top five processes being used by the system:
echo -e "\e[31;43m***** TOP 5 MEMORY CONSUMING PROCESSES *****\e[0m"
ps -eo %mem,%cpu,comm --sort=-%mem | head -n 6
echo ""
echo -e "\e[1;32mDone.\e[0m"
```

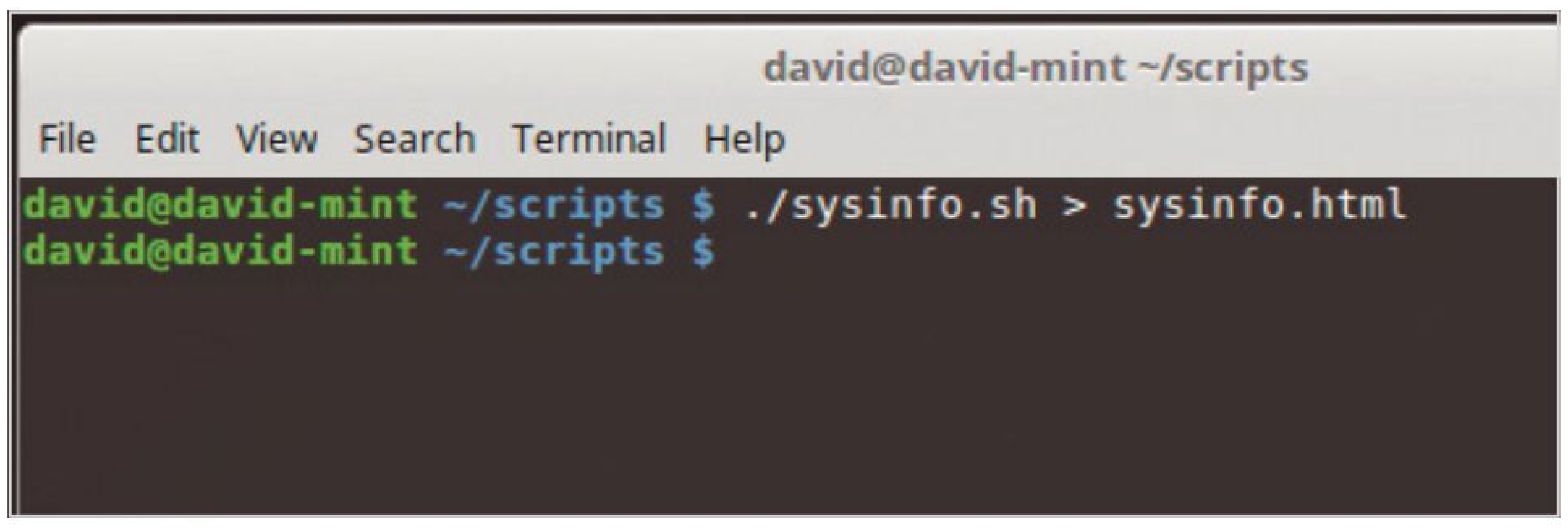
**STEP 2** We've included a couple of extra commands in this script. The first is the -e extension for echo, this means it'll enable echo interpretation of additional instances of a new line, as well as other special characters. The proceeding '31;43m' element enables colour for foreground and background.



```
david@david-mint ~/scripts $ ./sysinfo.sh
***** HOSTNAME INFORMATION *****
   Static hostname: david-mint
         Icon name: computer-vm
           Chassis: vm
        Machine ID: 5ab3c275b7304ed3b8aeef9ffcc37eb4
           Boot ID: 61ce1baadf934f649cf5ac809abe7e18
    Virtualization: oracle
  Operating System: Linux Mint 18.1
            Kernel: Linux 4.4.0-53-generic
      Architecture: x86-64

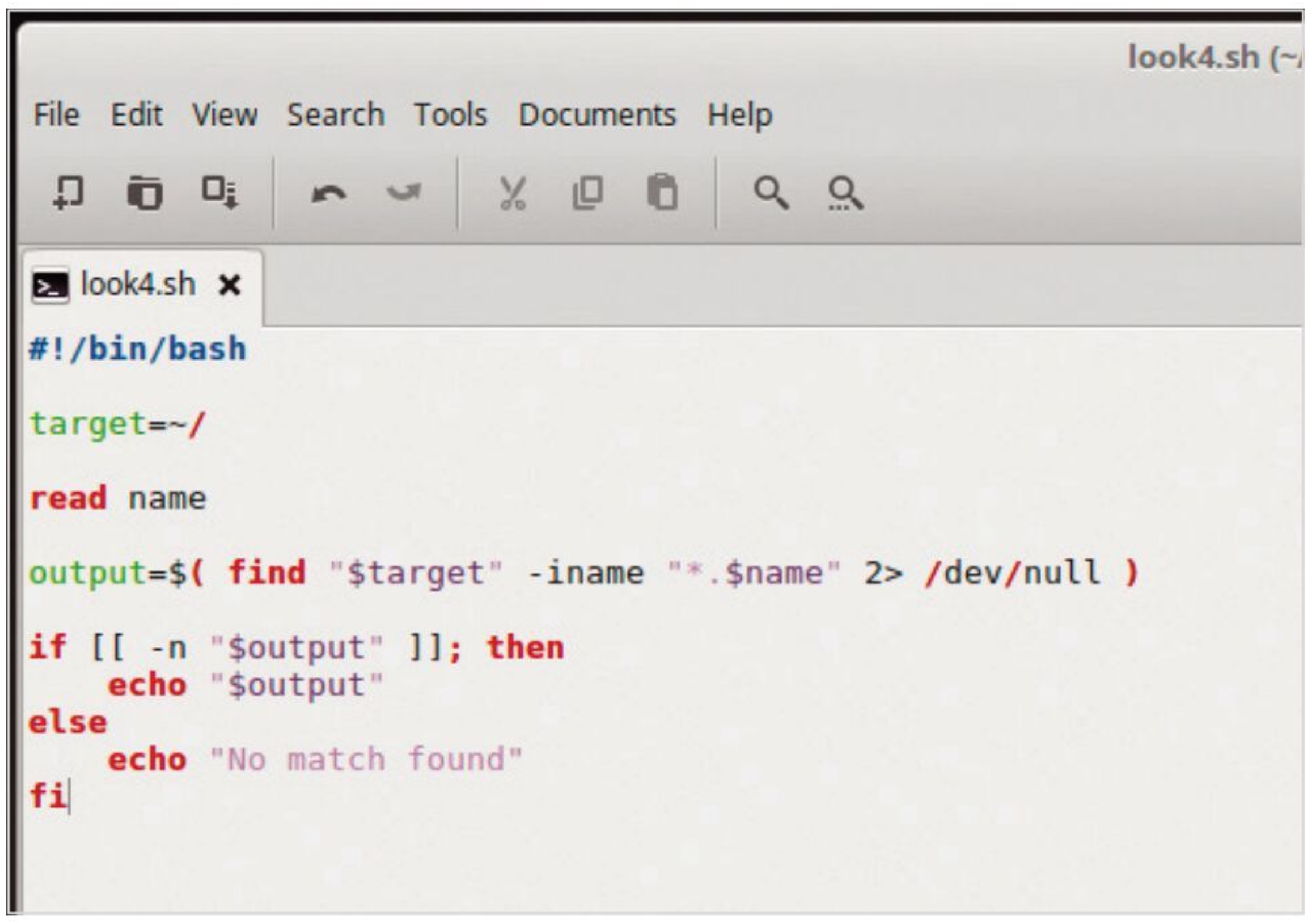
***** FILE SYSTEM DISK SPACE USE *****
```

**STEP 3** Each of the sections runs a different Terminal command, outputting the results under the appropriate heading. You can include a lot more, such as the current aliases being used in the system, the current time and date and so on. Plus, you could also pipe all that information into a handy HTML file, ready to be viewed in a browser.



```
david@david-mint ~/scripts $ ./sysinfo.sh > sysinfo.html
david@david-mint ~/scripts $
```

**STEP 4** Although there are simple Terminal commands to help you look for a particular file or folder, it's often more fun to create a script to help you. Plus, you can use that script for other non-technical users. Create a new script called `look4.sh`, entering the content from the screenshot below.



```
#!/bin/bash

target=~/

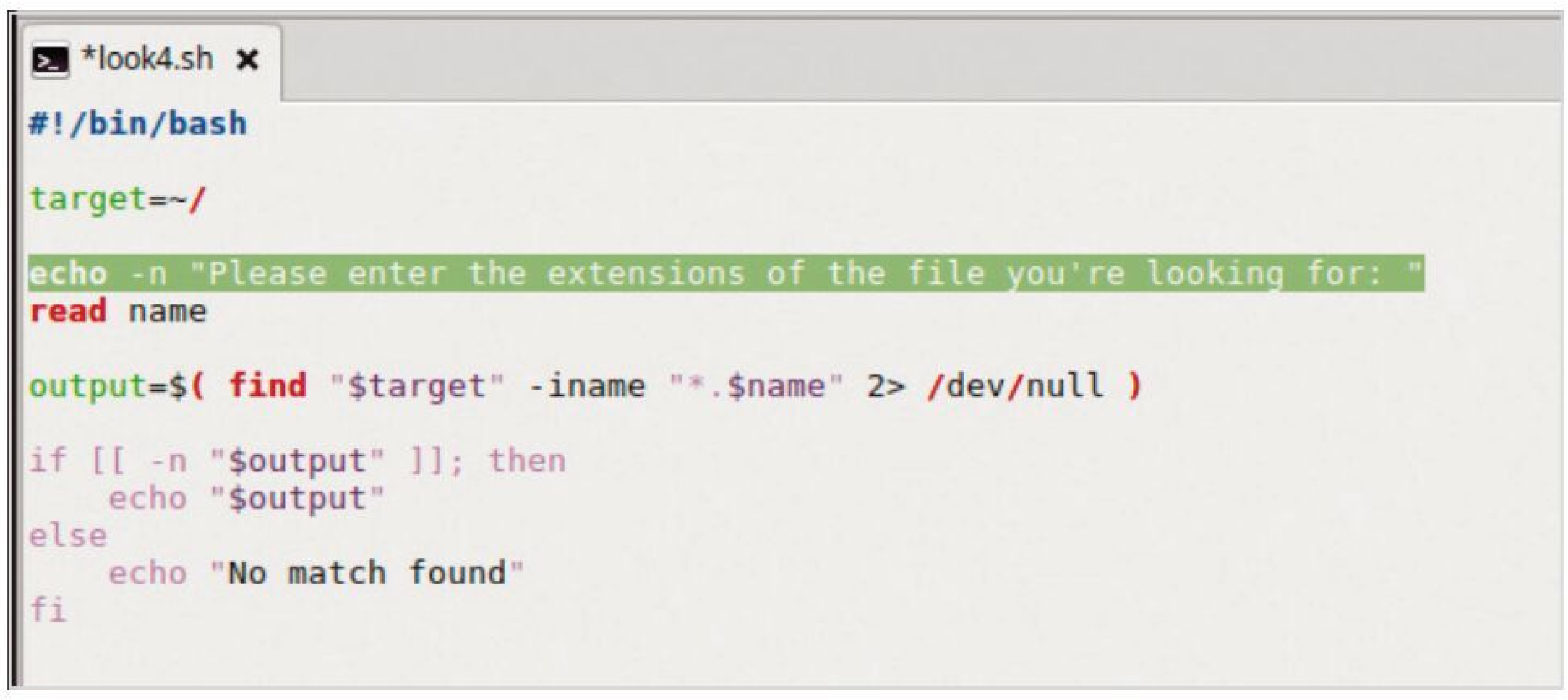
read name

output=$( find "$target" -iname "*.$name" 2> /dev/null )

if [[ -n "$output" ]]; then
    echo "$output"
else
    echo "No match found"
fi
```

## STEP 5

When executed the script waits for input from the user, in this case the file extension, such as jpg, mp4 and so on. It's not very friendly though. Let's make it a little friendlier. Add an echo, with: `echo -n “Please enter the extension of the file you’re looking for: “`, just before the read command.



```
*look4.sh
#!/bin/bash

target=~/

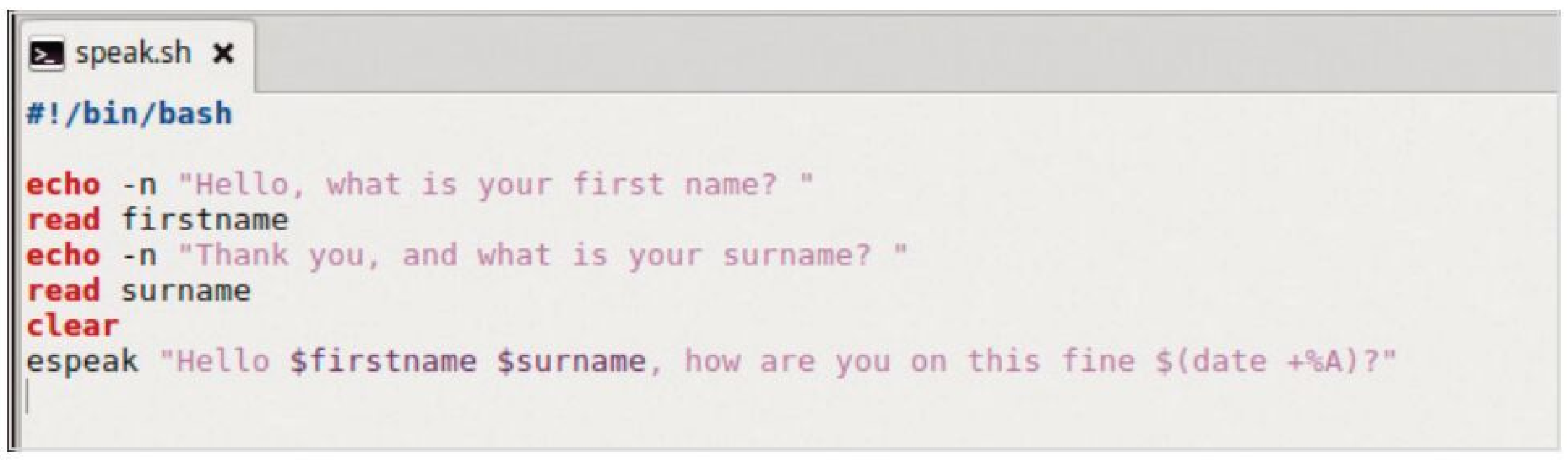
echo -n "Please enter the extensions of the file you're looking for: "
read name

output=$( find "$target" -iname "*.$name" 2> /dev/null )

if [[ -n "$output" ]]; then
    echo "$output"
else
    echo "No match found"
fi
```

## STEP 6

Here's an interesting, fun kind of script using the app espeak. Install espeak with `sudo apt-get install espeak`, then enter the text below into a new script called `speak.sh`. As you can see it's a rehash of the first greeting script we ran. Only this time, it uses the variables in the espeak output.

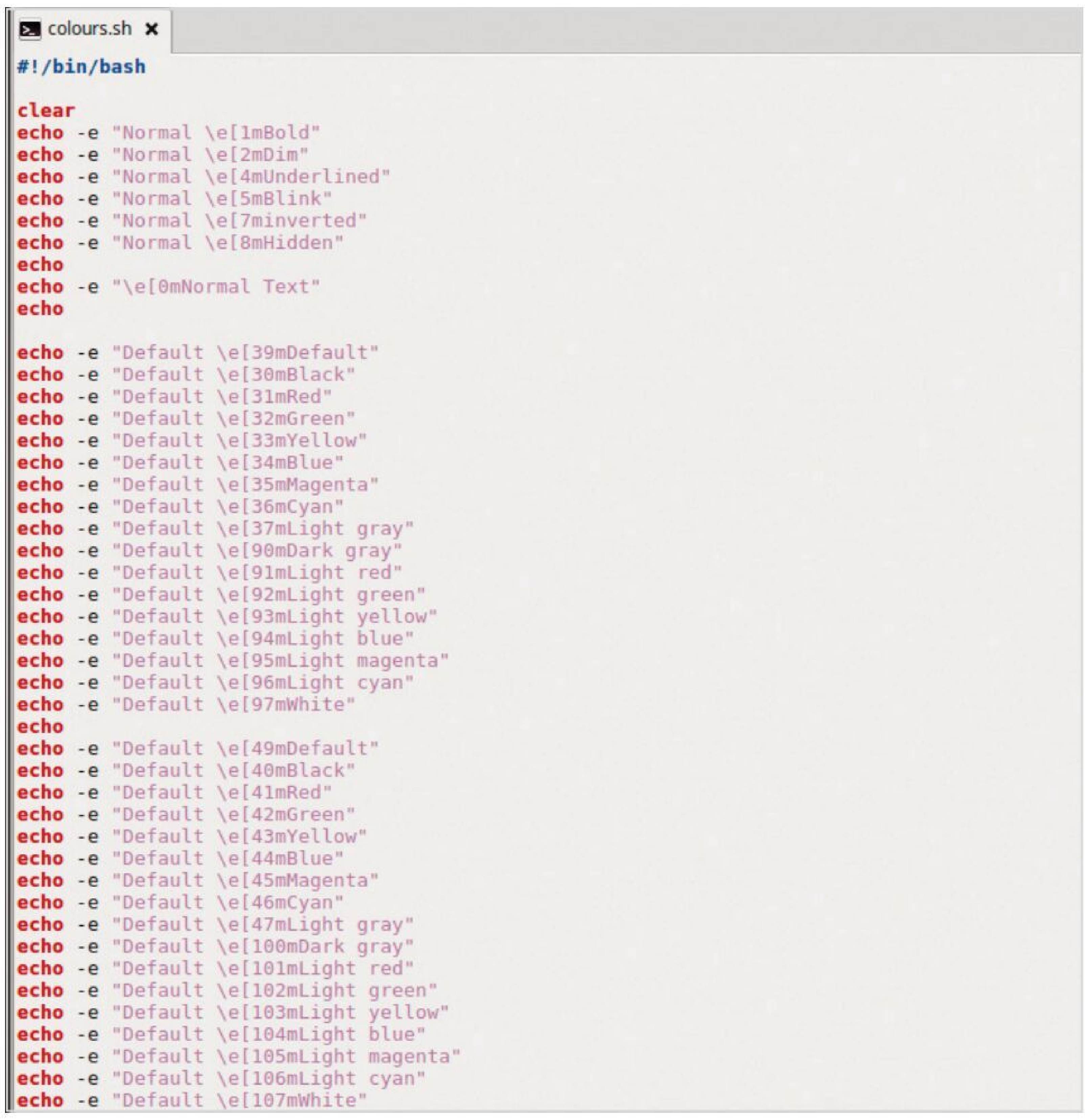


```
speak.sh
#!/bin/bash

echo -n "Hello, what is your first name? "
read firstname
echo -n "Thank you, and what is your surname? "
read surname
clear
espeak "Hello $firstname $surname, how are you on this fine $(date +%A)?"
```

## STEP 7

We briefly looked at putting some colours in the output for our scripts. Whilst it's too long to dig a little deeper into the colour options, here's a script that outputs what's available. Create a new script called `colours.sh` and enter the text (see below) into it.



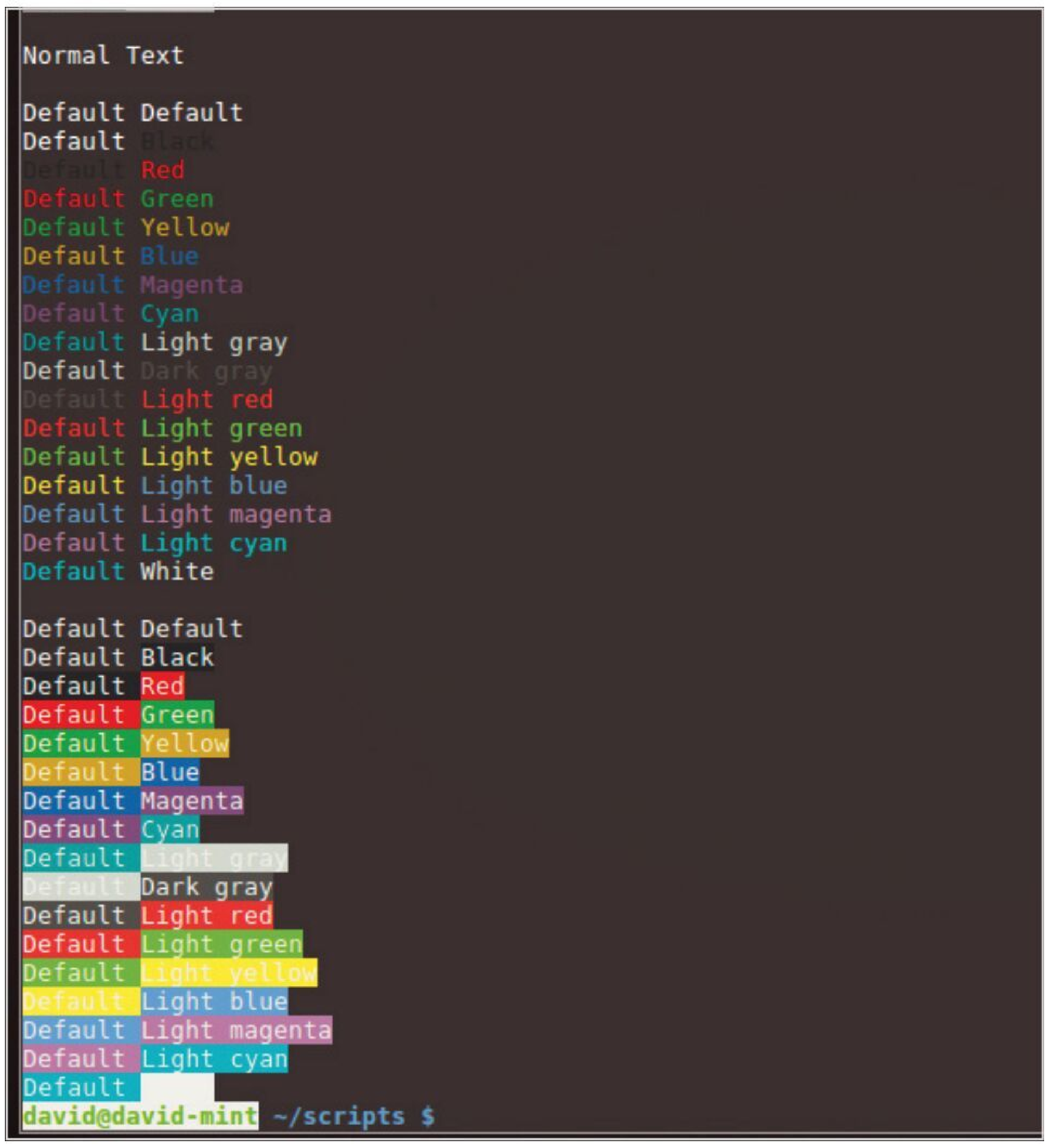
```
colours.sh
#!/bin/bash

clear
echo -e "Normal \e[1mBold"
echo -e "Normal \e[2mDim"
echo -e "Normal \e[4mUnderlined"
echo -e "Normal \e[5mBlink"
echo -e "Normal \e[7minverted"
echo -e "Normal \e[8mHidden"
echo
echo -e "\e[0mNormal Text"
echo

echo -e "Default \e[39mDefault"
echo -e "Default \e[30mBlack"
echo -e "Default \e[31mRed"
echo -e "Default \e[32mGreen"
echo -e "Default \e[33mYellow"
echo -e "Default \e[34mBlue"
echo -e "Default \e[35mMagenta"
echo -e "Default \e[36mCyan"
echo -e "Default \e[37mLight gray"
echo -e "Default \e[90mDark gray"
echo -e "Default \e[91mLight red"
echo -e "Default \e[92mLight green"
echo -e "Default \e[93mLight yellow"
echo -e "Default \e[94mLight blue"
echo -e "Default \e[95mLight magenta"
echo -e "Default \e[96mLight cyan"
echo -e "Default \e[97mWhite"
echo
echo -e "Default \e[49mDefault"
echo -e "Default \e[40mBlack"
echo -e "Default \e[41mRed"
echo -e "Default \e[42mGreen"
echo -e "Default \e[43mYellow"
echo -e "Default \e[44mBlue"
echo -e "Default \e[45mMagenta"
echo -e "Default \e[46mCyan"
echo -e "Default \e[47mLight gray"
echo -e "Default \e[100mDark gray"
echo -e "Default \e[101mLight red"
echo -e "Default \e[102mLight green"
echo -e "Default \e[103mLight yellow"
echo -e "Default \e[104mLight blue"
echo -e "Default \e[105mLight magenta"
echo -e "Default \e[106mLight cyan"
echo -e "Default \e[107mWhite"
```

## STEP 8

The output from colours.sh can, of course, be mixed together, bringing different effects depending on what you want to the output to say. For example, white text in a red background flashing (or blinking). Sadly the blinking effect doesn't work on all Terminals, so you may need to change to a different Terminal.



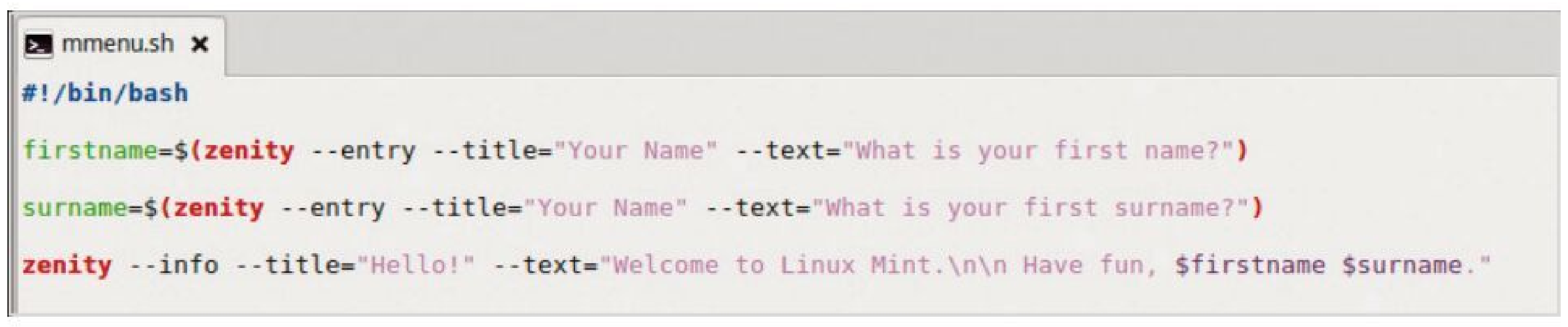
```
Normal Text

Default Default
Default Black
Default Red
Default Green
Default Yellow
Default Blue
Default Magenta
Default Cyan
Default Light gray
Default Dark gray
Default Light red
Default Light green
Default Light yellow
Default Light blue
Default Light magenta
Default Light cyan
Default White

Default Default
Default Black
Default Red
Default Green
Default Yellow
Default Blue
Default Magenta
Default Cyan
Default Light gray
Default Dark gray
Default Light red
Default Light green
Default Light yellow
Default Light blue
Default Light magenta
Default Light cyan
Default
david@david-mint ~/scripts $
```

## STEP 9

Whilst we're on making fancy scripts, how about using Zenity to output a graphical interface? Enter what you see below into a new script, `mmenu.sh`. Make it executable and then run it. You should have a couple of dialogue boxes appear, followed by a final message.



```
mmenu.sh
#!/bin/bash

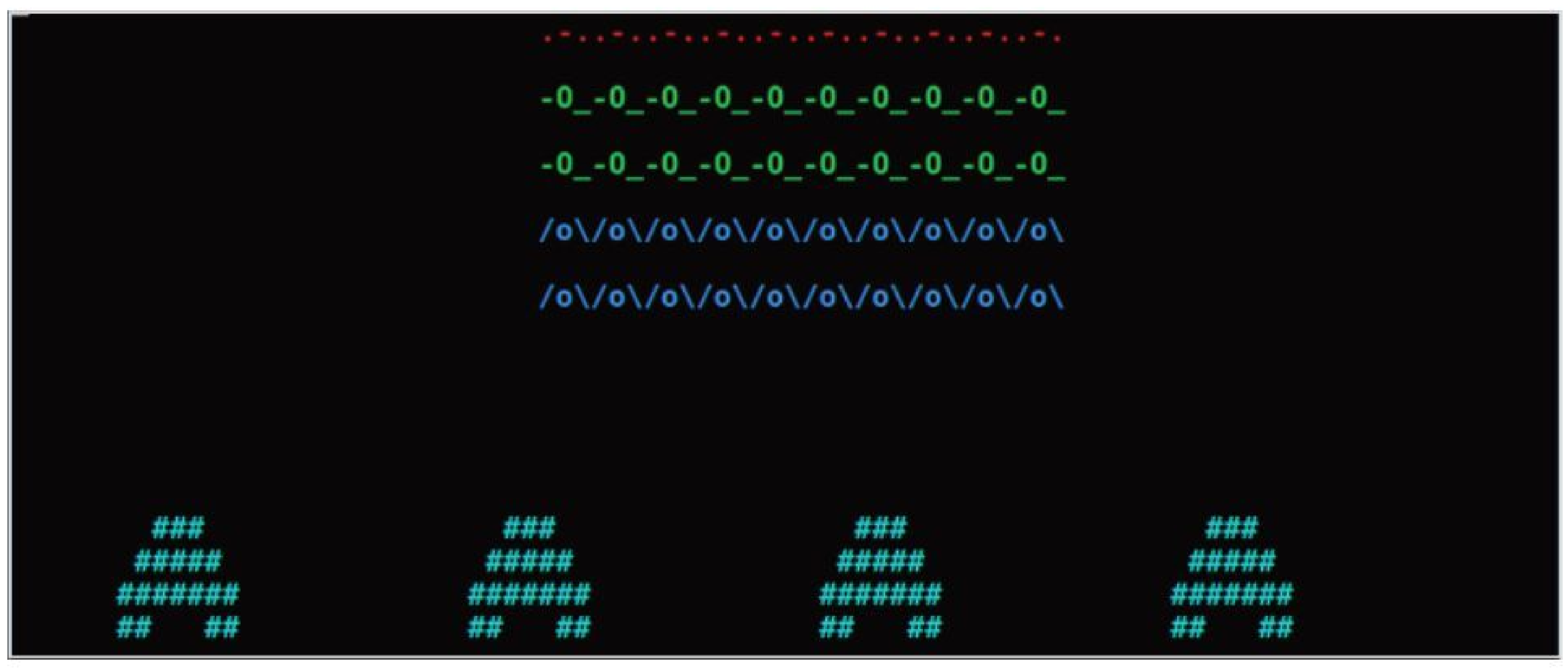
firstname=$(zenity --entry --title="Your Name" --text="What is your first name?")

surname=$(zenity --entry --title="Your Name" --text="What is your first surname?")

zenity --info --title="Hello!" --text="Welcome to Linux Mint.\n\n Have fun, $firstname $surname."
```

## STEP 10

While gaming in a Bash script isn't something that's often touched upon, it is entirely possible, albeit, a little basic. Movement-based games are diffiuclt, and sometimes buggy, however a good text adventure, or Fighting Fantasy type game is a perfect choice for gaming in the Terminal. give it a go, and let us know how you get on.



```
                      .-..-..-..-..-..-..-..-..-..-.

                      -0_-0_-0_-0_-0_-0_-0_-0_-0_-0_

                      -0_-0_-0_-0_-0_-0_-0_-0_-0_-0_

                      /o\/o\/o\/o\/o\/o\/o\/o\/o\/o\

                      /o\/o\/o\/o\/o\/o\/o\/o\/o\/o\




     ###               ###               ###               ###
    #####             #####             #####             #####
   #######           #######           #######           #######
   ##   ##           ##   ##           ##   ##           ##   ##
```

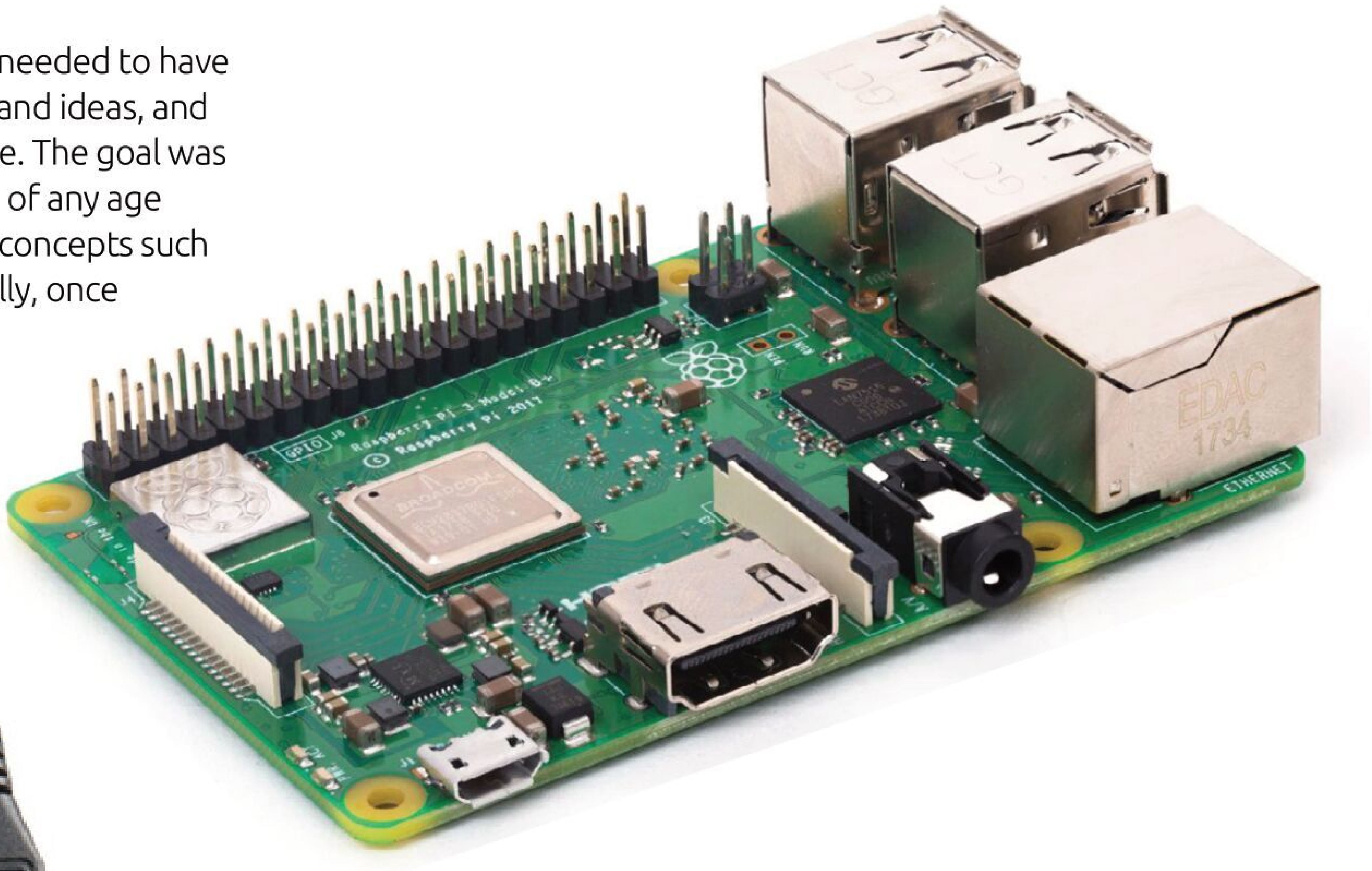
# Pi x Linux = The Perfect Combination

**The Raspberry Pi is a remarkable piece of hardware, and to help drive its potential it needs a remarkable operating system. Thankfully, Linux is the default and recommended OS of choice for the Pi, and together they make a winning team.**

**When the Raspberry Pi was in its developmental stages its designers needed to ensure that they were creating a piece of hardware that could offer much more than simply being a cheap, but small, computer.**

The Pi needed to be flexible with what it could do, it needed to have room to grow into more ambitious project concepts and ideas, and it needed to do so in as easy to use fashion as possible. The goal was to create a universal learning platform, that students of any age could expand on and tinker with, while learning new concepts such as programming, electronics, and computing. Naturally, once the hardware was developed, the only real choice of operating system was of course, Linux.

The versatility of Linux is legendary. This incredible core OS is so malleable that it can be steered toward near any aspect of computing, from supercomputing to robotics, the space industry to more terrestrial engineering; education and science, manufacturing and the Internet. Think of an industry, and you will likely find a Linux installation somewhere in the background keeping it all together.



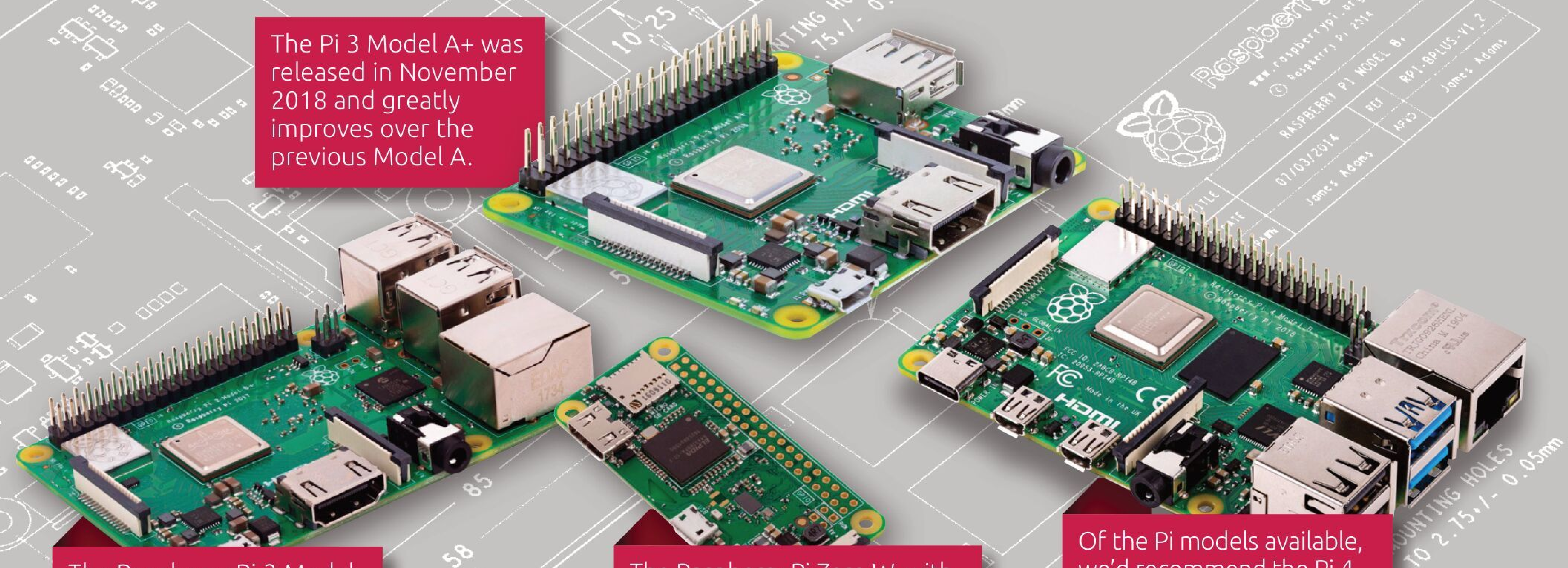
12:33
lcd_demo.py

Raspbian is the recommended operating system for the Raspberry Pi, a customised Debian-based distribution that comes packed with a collection of useful tools that cater for coding, electronics, and general desktop computing duties. Alongside the apps are pre-loaded modules to help get the most from each of the programming languages you decide to learn and use, as well as software to hardware modules that will enable you to power and use the hardware specific items unique to the Pi. For example, there are Python modules that interact with the Raspberry Pi's 40-pin GPIO, allowing you to create content for any of the Hardware Attached on Top devices.

This combination is what makes the Raspberry Pi an excellent base of operations to learn not only coding on, but also Linux in general. Raspbian, being Debian-based, will be able to run any of the Terminal commands listed in this book, as Linux Mint and even Ibuntu are also Debian-based. And since the Raspberry is so nall, and costs very little setup, you're able to have both your regular, Windows or macOS computers, and have a Raspberry Pi as a headless (a powered device that doesn't need a keyboard, mouse or monitor attached, as you connect to it remotely) computer from which you can connect to and learn how to use Linux and how to code.

## WHICH PI?

There are several Raspberry Pi models available, with each offering something slightly different from the others. The most recent Pi released is the Raspberry Pi 4 Model B, and while this model is slightly more expensive than some of the other examples, it is the most powerful and feature-rich Pi available. Overall, it's probably best to start experimenting with the Pi using the Pi 4 Model B, then moving on to one of the other models as you develop your skills and focus on a particular project, such as the need to use one of the Pi Zero models, with a smaller footprint and WiFi enabled connectivity.



The Pi 3 Model A+ was released in November 2018 and greatly improves over the previous Model A.

The Raspberry Pi 3 Model B+ is one of the best Pi models available.

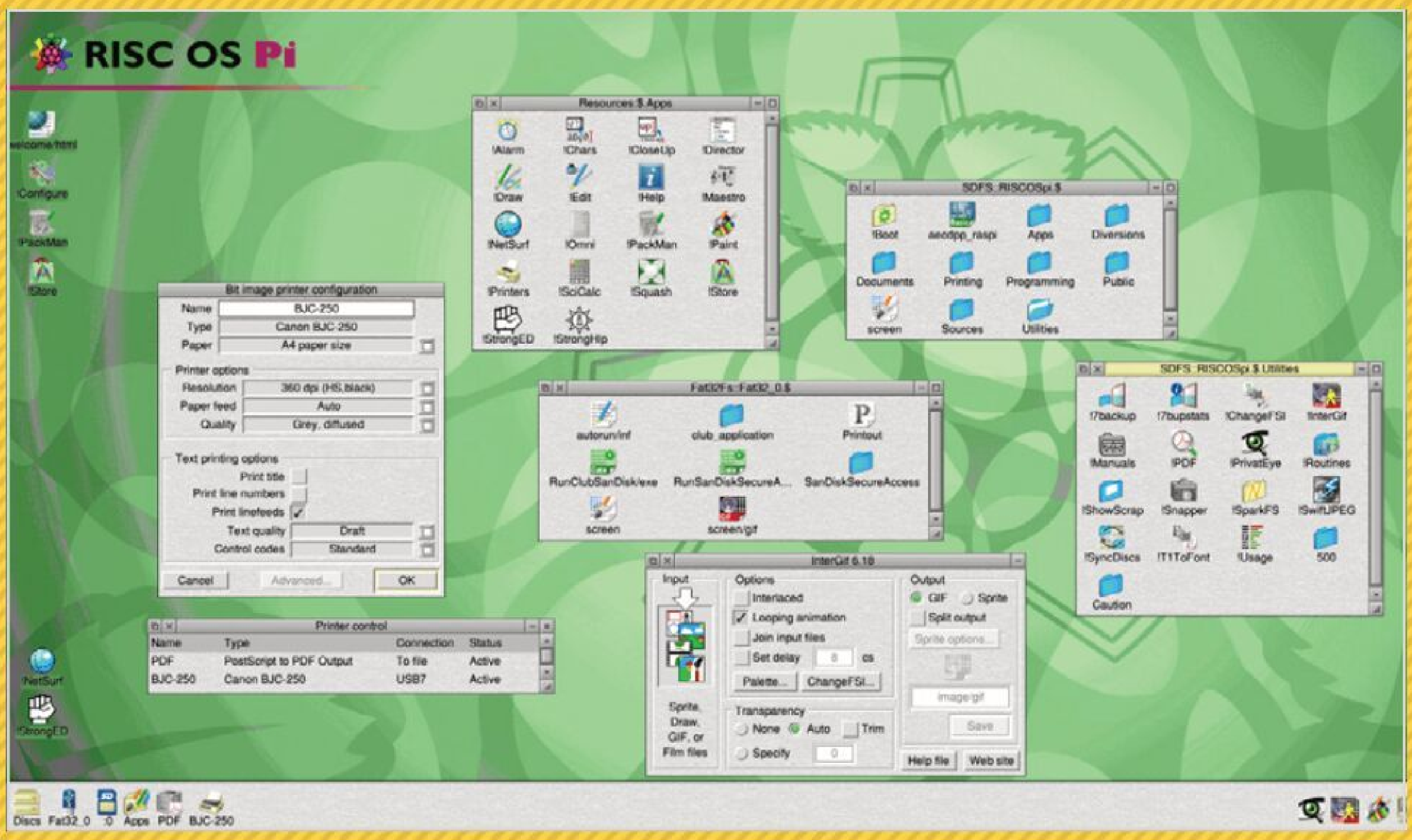
The Raspberry Pi Zero W, with built-in Wi-Fi and Bluetooth, is a great project Pi.

Of the Pi models available, we'd recommend the Pi 4 Model B, Pi 3 Model B+ and Pi Zero W.

## BEYOND THE RASPBERRY PI OS

The flexibility of the Raspberry Pi's ARM processor means that it's capable of running other operating systems beyond it's default Raspberry Pi OS. Still keeping with Linux, you can instead install Ubuntu MATE, Pidora (a Fedora-based distribution), Lakka, PiPlay (a retro emulation distribution) and Arch Linux ARM. There are also systems based loosely on the Linux kernel, such as Android, Minibian, and Chromium OS.

There's Windows 10 IoT Core, FreeBSD, RISC OS PI, Plan 9 and, remarkably, AROS – an Amiga OS clone. Needless to say, that once you've finished experimenting with one version of Linux, just as you would with a desktop version of Linux, you can hop to another on the Raspberry Pi and see how that one works, and whether it will work for you.



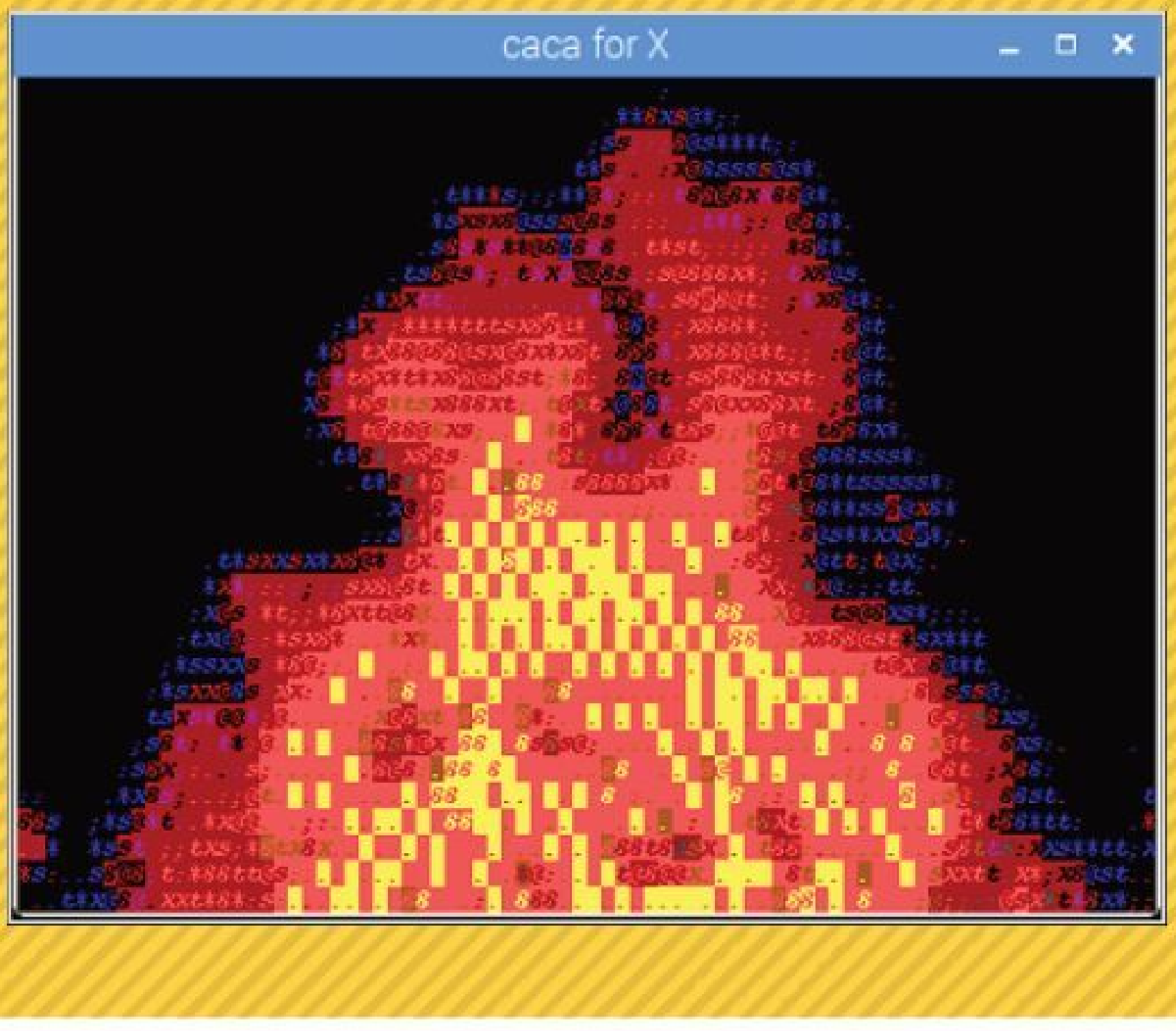
## PI, LINUX AND CODING

As previously mentioned, the Raspberry Pi is an excellent code base, and with Linux as the backbone you're able to start learning how to code in a multitude of different programming languages.

Bash scripting works perfectly, since Raspbian is Linux, and Debian-based, and you can easily expand your scripts to encompass much of the Pi's functionality. Aside from creating backup scripts, you can also create scripts that can access the GPIO pins on the Pi, and in so be able to control LEDs, and even more complex HATs.

Python is by far the most popular choice for beginners, and Raspbian comes pre-installed with everything you will need to get the most from your Python experience. There are countless pre-loaded modules, as well as the most recent stable release of the language.

C++ is one of the most powerful programming languages to learn. It's used for games, apps, and even entire operating systems. The Raspberry Pi comes with a great C++ editor, that's easy to use and can help you develop amazing content. Whichever way you decide to take your coding and Linux adventure, the Raspberry Pi is an excellent platform from which to begin on.



# Command Line Quick Reference

When you start using Linux full time, you will quickly realise that the graphical interfaces of Ubuntu, Mint, etc. are great for many tasks but not great for all tasks. Understanding how to use the command line not only builds your understanding of Linux but also improves your knowledge of coding and programming in general. Our command line quick reference guide is designed to help you master Linux quicker.

## TOP 10 COMMANDS

**These may not be the most common commands used by everyone but they will certainly feature frequently for many users of Linux and the command line.**

**cd**

The `cd` command is one of the commands you will use the most at the command line in Linux. It allows you to change your working directory. You use it to move around within the hierarchy of your file system. You can also use chdir.

**ls**

The `ls` command shows you the files in your current directory. Used with certain options, it lets you see file sizes, when files where created and file permissions. For example, `ls` ~ shows you the files that are in your home directory.

**cp**

The `cp` command is used to make copies of files and directories. For example, `cp file sub` makes an exact copy of the file whose name you entered and names the copy sub but the first file will still exist with its original name.

**pwd**

The `pwd` command prints the full pathname of the current working directory (pwd stands for "print working directory"). Note that the GNOME terminal also displays this information in the title bar of its window.

**clear**

The `clear` command clears your screen if this is possible. It looks in the environment for the terminal type and then in the terminfo database to figure out how to clear the screen. This is equivalent to typing Control-L when using the bash shell.

**mv**

The `mv` command moves a file to a different location or renames a file. For example `mv file sub` renames the original file to `sub. mv sub ~/Desktop` moves the file 'sub' to your desktop directory but does not rename it. You must specify a new filename to rename a file.

**chown**

The `chown` command changes the user and/or group ownership of each given file. If only an owner (a user name or numeric user ID) is given, that user is made the owner of each given file, and the files' group is not changed.

**cmod**

The `chmod` command changes the permissions on the files listed. Permissions are based on a fairly simple model. You can set permissions for user, group and world and you can set whether each can read, write and or execute the file.

**rm**

The `rm` command removes (deletes) files or directories. The removal process unlinks a filename in a filesystem from data on the storage device and marks that space as usable by future writes. In other words, removing files increases the amount of available space on your disk.

**mkdir**

Short for "make directory", `mkdir` is used to create directories on a file system, if the specified directory does not already exist. For example, `mkdir` work creates a work directory. More than one directory may be specified when calling mkdir.

C:\Commonly_Used_Commands
SAMSUNG

## USEFUL HELP/INFO COMMANDS

**The following commands are useful for when you are trying to learn more about the system or program you are working with in Linux. You might not need them every day, but when you do, they will be invaluable.**

| | |
|---|---|
| free | The `free` command displays the total amount of free and used physical and swap memory in the system. For example, `free -m` gives the information using megabytes. |
| df | The `df` command displays filesystem disk space usage for all partitions. The command `df-h` is probably the most useful (the -h means human-readable). |
| top | The `top` program provides a dynamic real-time view of a running system. It can display system summary information, as well as a list of processes. |
| unmame-a | The `uname` command with the `-a` option prints all system information, including machine name, kernel name, version and a few other details. |
| ps | The `ps` command allows you to view all the processes running on the machine. Every operating system's version of ps is slightly different but all do the same thing. |
| grep | The `grep` command allows you to search inside a number of files for a particular search pattern and then print matching lines. An example would be: `grep blah file`. |
| sed | The `sed` command opens a stream editor. A stream editor is used to perform text transformations on an input stream: a file or input from a pipeline. |
| adduser | The `adduser` command adds a new user to the system. Similarly, the addgroup command adds a new group to the system. |
| deluser | The `deluser` command removes a user from the system. To remove the user's files and home directory, you need to add the `-remove-home` option. |
| delgroup | The `delgroup` command removes a group from the system. You cannot remove a group that is the primary group of any users. |
| man man | The `man man` command brings up the manual entry for the man command, which is a great place to start when using it. |
| man intro | The `man intro` command is especially useful. It displays the Introduction to User Commands, which is a well written, fairly brief introduction to the Linux command line. |

# A-Z of Linux Commands

There are literally thousands of Linux commands, so while this is not a complete A-Z, it does contain many of the commands you will most likely need. You will probably find that you end up using a smaller set of commands over and over again but having an overall knowledge is still very useful.

## A

| | |
|---|---|
| `adduser` | Add a new user |
| `arch` | Print machine architecture |
| `awk` | Find and replace text within file(s) |

## B

| | |
|---|---|
| `bc` | An arbitrary precision calculator language |

## C

| | |
|---|---|
| `cat` | Concatenate files and print on the standard output |
| `chdir` | Change working directory |
| `chgrp` | Change the group ownership of files |
| `chroot` | Change root directory |
| `cksum` | Print CRC checksum and byte counts |
| `cmp` | Compare two files |
| `comm` | Compare two sorted files line by line |
| `cp` | Copy one or more files to another location |
| `crontab` | Schedule a command to run at a later time |
| `csplit` | Split a file into context-determined pieces |
| `cut` | Divide a file into several parts |

## D

| | |
|---|---|
| `date` | Display or change the date & time |
| `dc` | Desk calculator |
| `dd` | Data Dump, convert and copy a file |
| `diff` | Display the differences between two files |
| `dirname` | Convert a full path name to just a path |
| `du` | Estimate file space usage |

## E

| | |
|---|---|
| `echo` | Display message on screen |
| `ed` | A line oriented text editor (edlin) |
| `egrep` | Search file(s) for lines that match an extended expression |
| `env` | Display, set or remove environment variables |
| `expand` | Convert tabs to spaces |
| `expr` | Evaluate expressions |

## F

| | |
|---|---|
| `factor` | Print prime factors |
| `fdisk` | Partition table manipulator for Linux |
| `fgrep` | Search file(s) for lines that match a fixed string |
| `find` | Search for files that meet a desired criteria |
| `fmt` | Reformat paragraph text |
| `fold` | Wrap text to fit a specified width |
| `format` | Format disks or tapes |
| `fsck` | Filesystem consistency check and repair |

## G

| | |
|---|---|
| `gawk` | Find and Replace text within file(s) |
| `grep` | Search file(s) for lines that match a given pattern |
| `groups` | Print group names a user is in |
| `gzip` | Compress or decompress named file(s) |

## H

| | |
|---|---|
| `head` | Output the first part of file(s) |
| `hostname` | Print or set system name |

## I

| | |
|---|---|
| `id` | Print user and group ids |
| `info` | Help info |
| `install` | Copy files and set attributes |

## J

| | |
|---|---|
| `join` | Join lines on a common field |

## K

| | |
|---|---|
| `kill` | Stop a process from running |

## L

| | |
|---|---|
| `less` | Display output one screen at a time |
| `ln` | Make links between files |
| `locate` | Find files |

| | |
|---|---|
| `logname` | Print current login name |
| `lpc` | Line printer control program |
| `lpr` | Off line print |
| `lprm` | Remove jobs from the print queue |

# M

| | |
|---|---|
| `man` | See Help manual |
| `mkdir` | Create new folder(s) |
| `mkfifo` | Make FIFOs (named pipes) |
| `mknod` | Make block or character special files |
| `more` | Display output one screen at a time |
| `mount` | Mount a file system |

# N

| | |
|---|---|
| `nice` | Set the priority of a command or job |
| `nl` | Number lines and write files |
| `nohup` | Run a command immune to hangups |

# P

| | |
|---|---|
| `passwd` | Modify a user password |
| `paste` | Merge lines of files |
| `pathchk` | Check file name portability |
| `pr` | Convert text files for printing |
| `printcap` | Printer capability database |
| `printenv` | Print environment variables |
| `printf` | Format and print data |

# Q

| | |
|---|---|
| `quota` | Display disk usage and limits |
| `quotacheck` | Scan a file system for disk usage |
| `quotactl` | Set disk quotas |

# R

| | |
|---|---|
| `ram` | Ram disk device |
| `rcp` | Copy files between two machines |
| `rm` | Remove files |
| `rmdir` | Remove folder(s) |
| `rpm` | Remote Package Manager |
| `rsync` | Remote file copy (synchronise file trees) |

# S

| | |
|---|---|
| `screen` | Terminal window manager |
| `sdiff` | Merge two files interactively |
| `select` | Accept keyboard input |
| `seq` | Print numeric sequences |
| `shutdown` | Shutdown or restart linux |
| `sleep` | Delay for a specified time |
| `sort` | Sort text files |
| `split` | Split a file into fixed-size pieces |
| `su` | Substitute user identity |
| `sum` | Print a checksum for a file |
| `symlink` | Make a new name for a file |
| `sync` | Synchronise data on disk with memory |

# T

| | |
|---|---|
| `tac` | Concatenate and write files in reverse |
| `tail` | Output the last part of files |
| `tar` | Tape Archiver |
| `tee` | Redirect output to multiple files |
| `test` | Evaluate a conditional expression |
| `time` | Measure Program Resource Use |
| `touch` | Change file timestamps |
| `top` | List processes running on the system |
| `traceroute` | Trace Route to Host |
| `tr` | Translate, squeeze and or delete characters |
| `tsort` | Topological sort |

# U

| | |
|---|---|
| `umount` | Unmount a device |
| `unexpand` | Convert spaces to tabs |
| `uniq` | Uniquify files |
| `units` | Convert units from one scale to another |
| `unshar` | Unpack shell archive scripts |
| `useradd` | Create new user account |
| `usermod` | Modify user account |
| `users` | List users currently logged in |

# V

| | |
|---|---|
| `vdir` | Verbosely list directory contents (`ls -l -b') |

# W

| | |
|---|---|
| `watch` | Execute or display a program periodically |
| `wc` | Print byte, word, and line counts |
| `whereis` | Report all known instances of a command |
| `which` | Locate a program file in the user's path |
| `who` | Print all usernames currently logged in |
| `whoami` | Print the current user id and name |

# X

| | |
|---|---|
| `xargs` | Execute utility, passing constructed argument list(s) |

# Y

| | |
|---|---|
| `yes` | Print a string until interrupted |

Altix ICE 8400
sgi

**DID YOU KNOW…** that NASA's state-of-the-art supercomputing cluster, Pleiades, is powered by Linux? Pleiades consists of 160 racks (11,440 nodes), 245,536 CPU cores, a total memory count of 935TB, 184,320 NVIDIA CUDA cores, and over six miles of fibre optic cabling.

At the heart of it lies a complex setup of SUSE Linux Enterprise Server, along with many custom development packages and other software unique to NASA's projects. The projects NASA's Advanced Supercomputing Division uses Pleiades for are: The Kepler Mission – searching for extra-solar Earth-like planets; CFD (Computational Fluid Dynamics) modelling to help create more efficient space launch systems; Dark Matter research and simulation; and visualisation of Earth's ocean currents, building data for the ECCO (Estimating the Circulation and Climate of the Ocean) Project.

NASA's Linux-powered supercomputer, Pleiades. Currently ranked the 11th most powerful in the world.

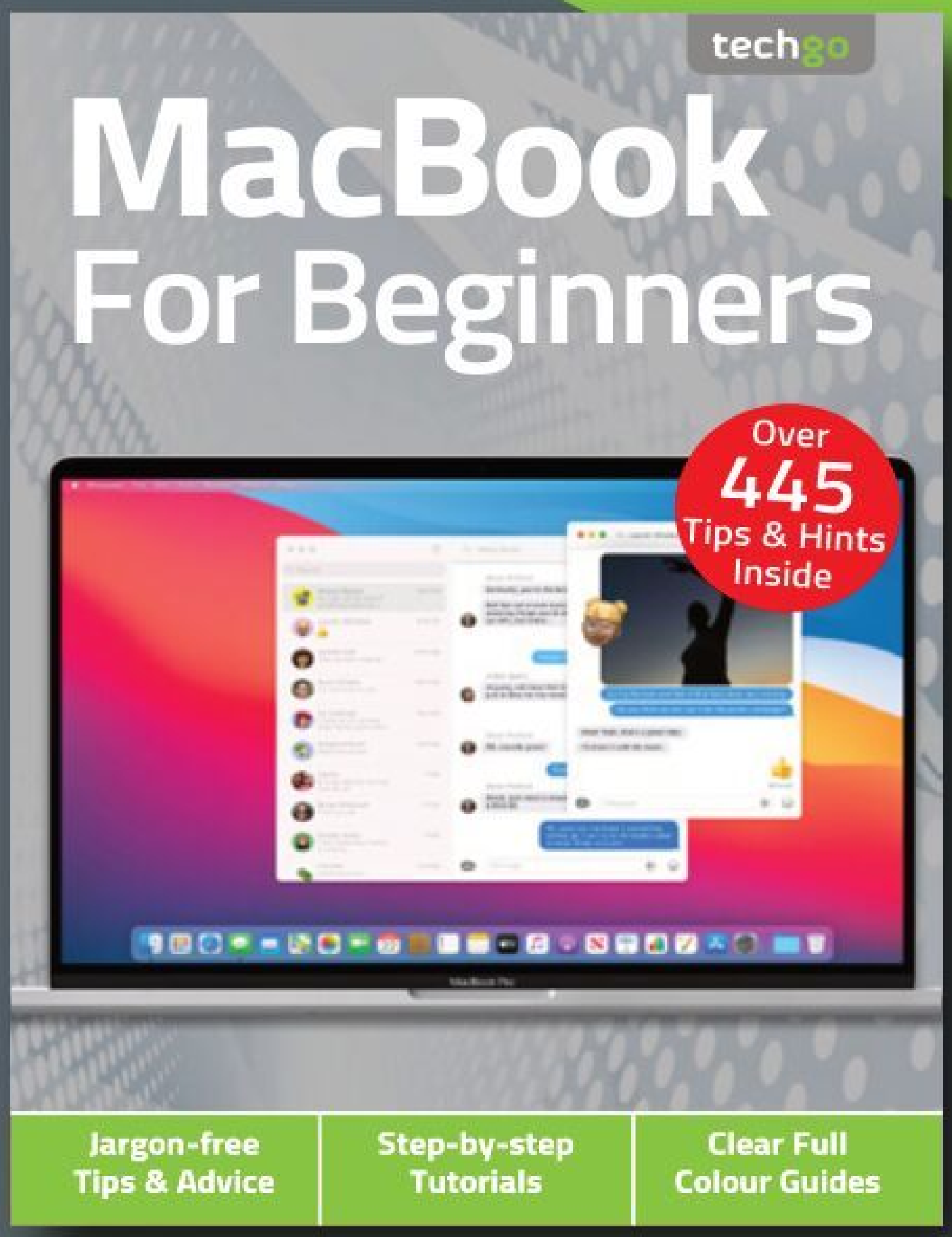
# Good enough for **NASA**

Now you've got the basics down, you can improve and learn more essential skills in our next guide...

# Linux
## Tricks and Tips

Coming soon!

# Discover more of our guides...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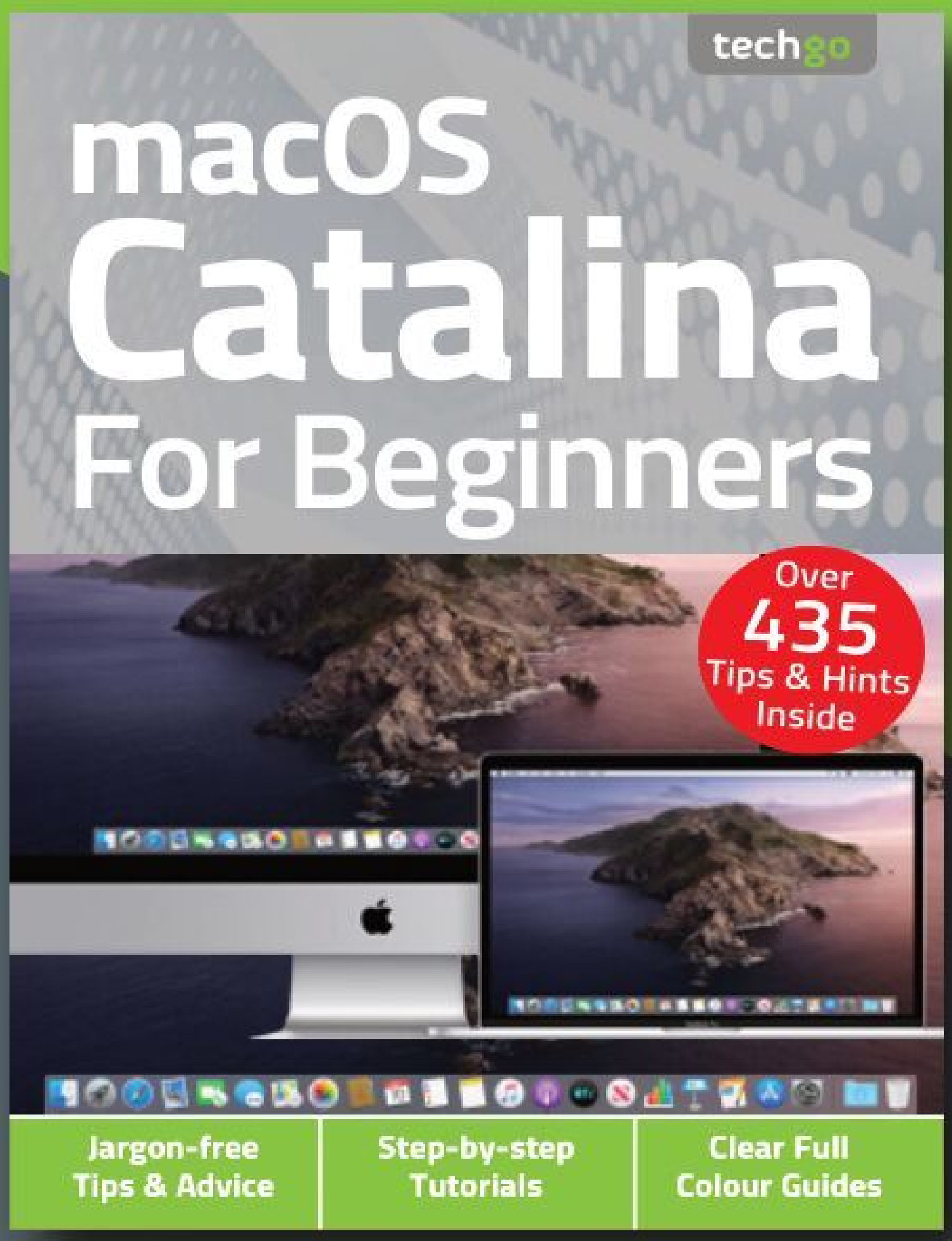
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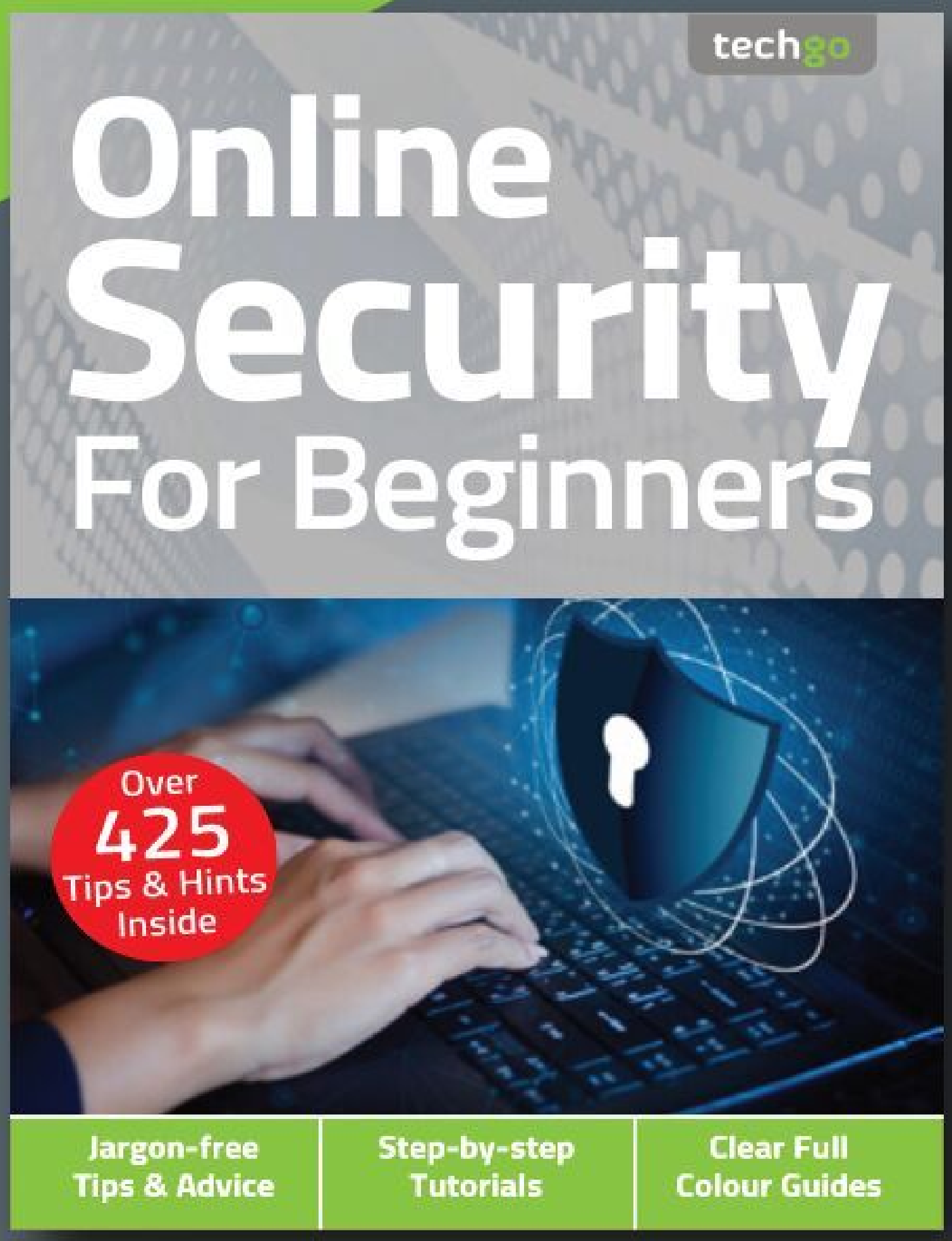
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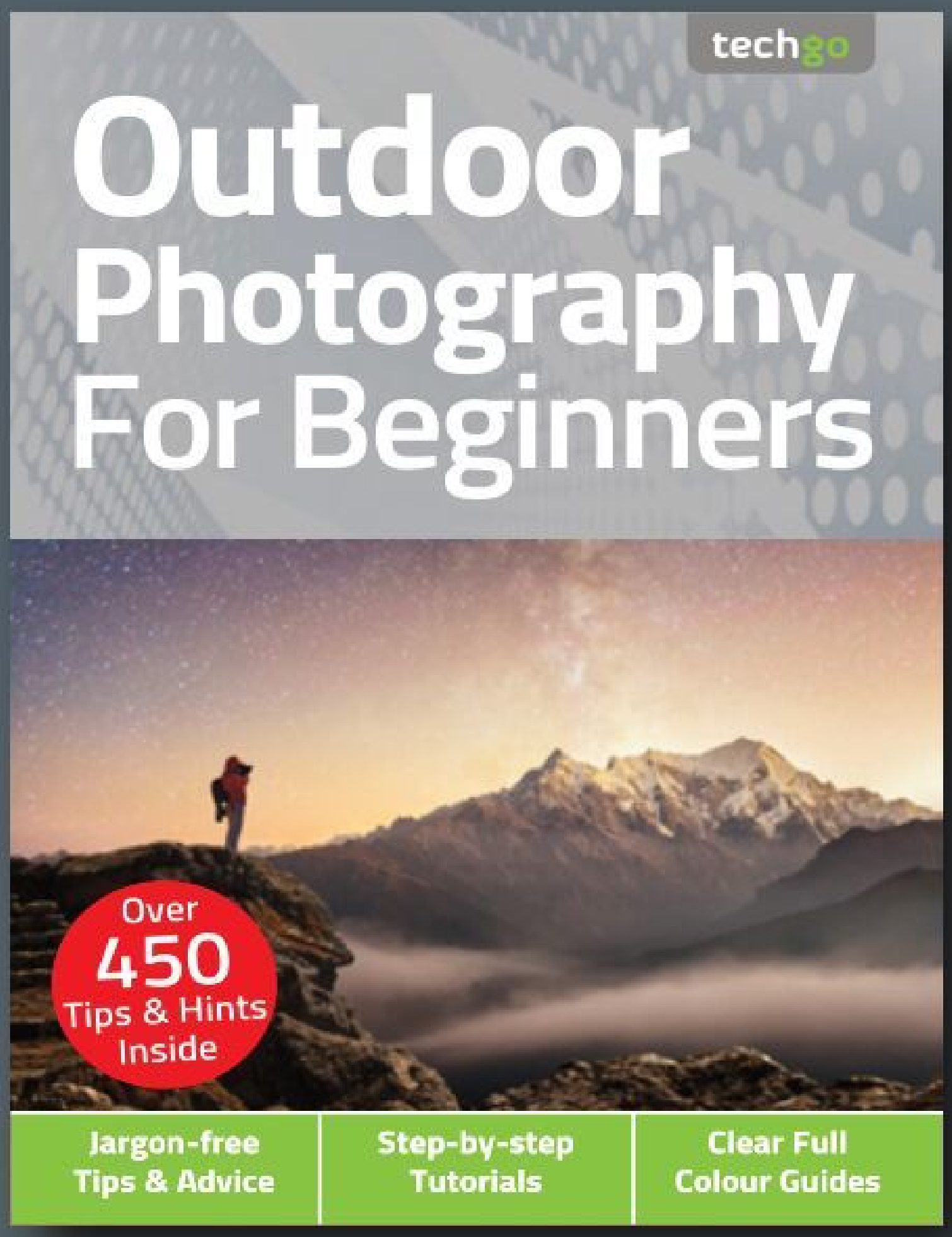
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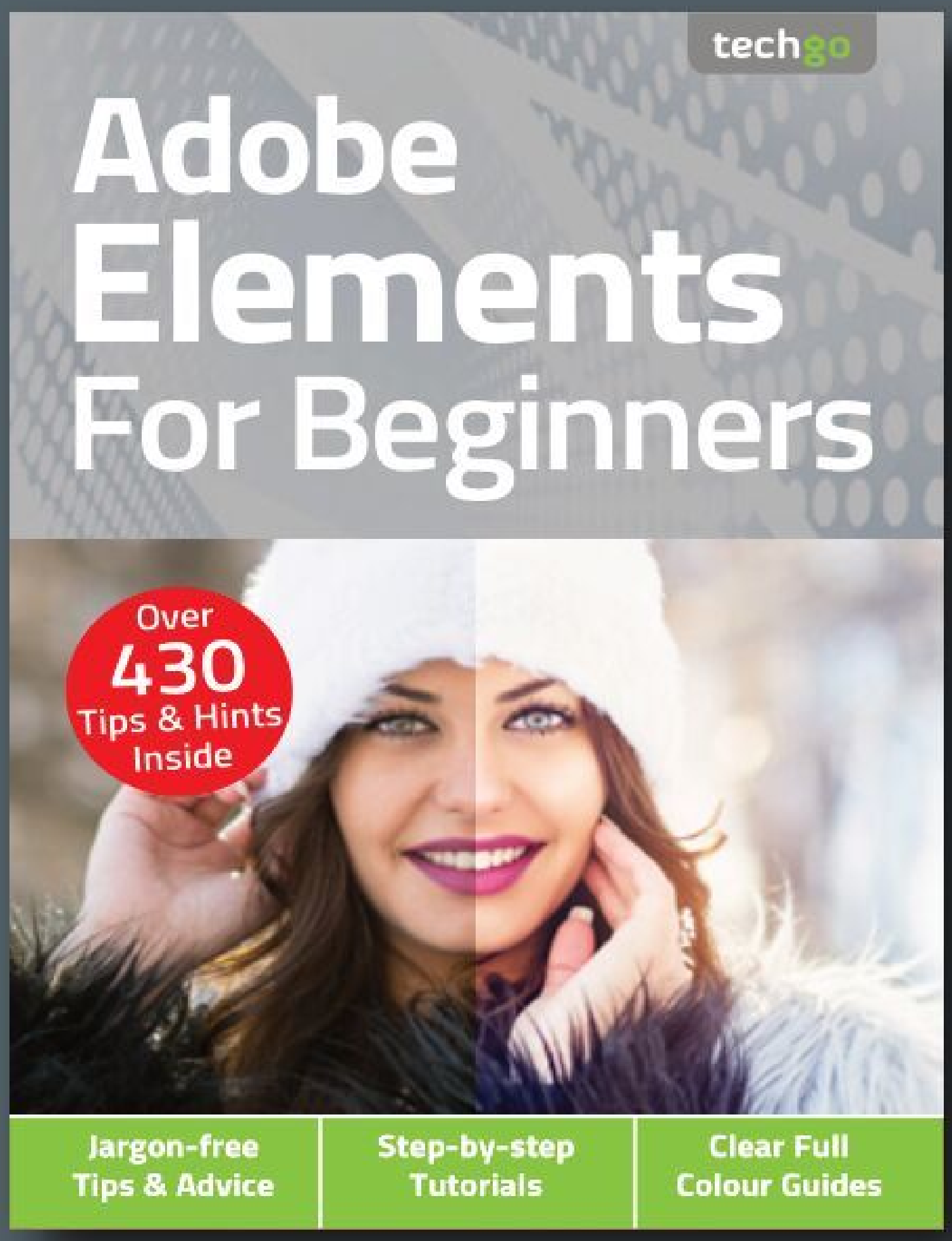
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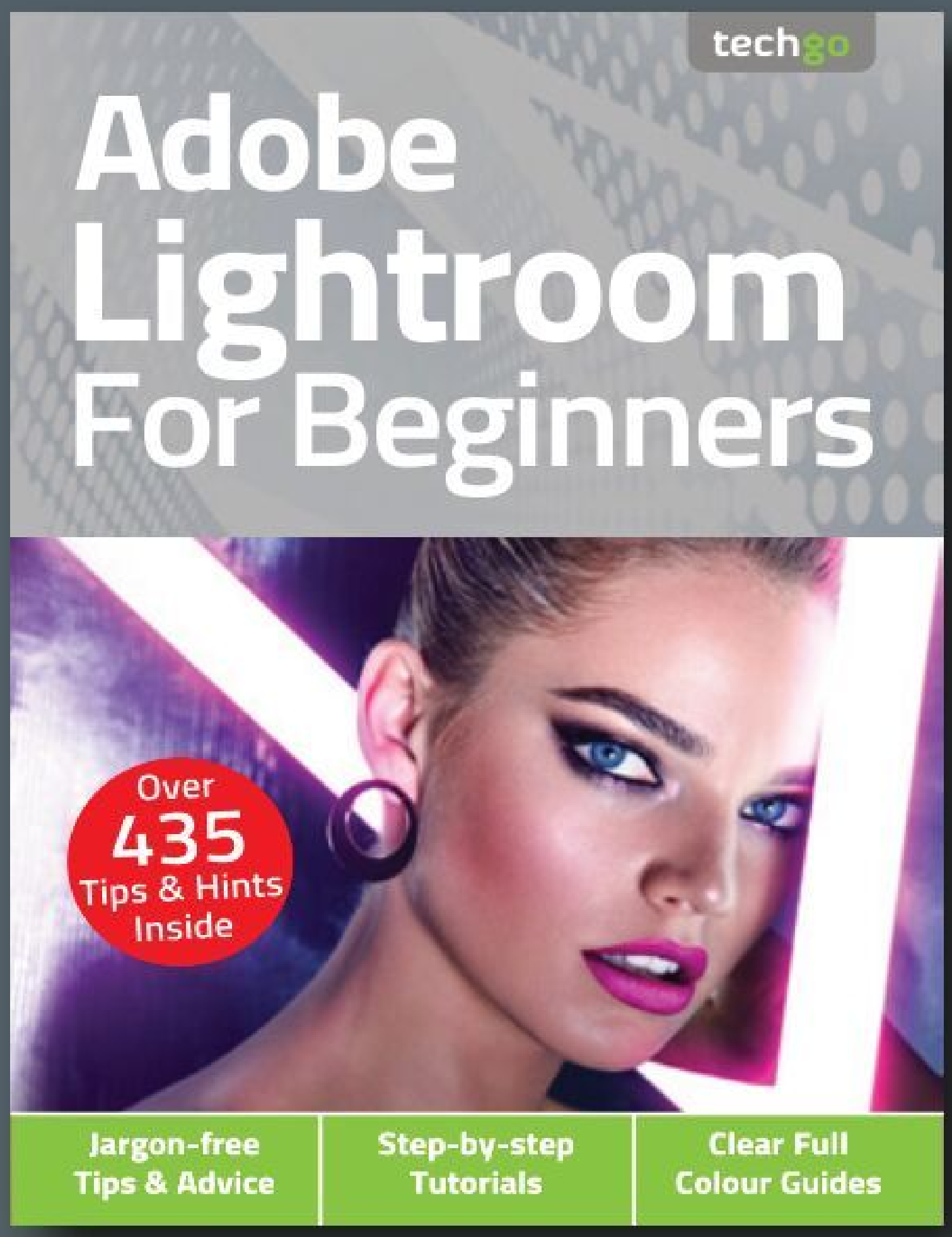
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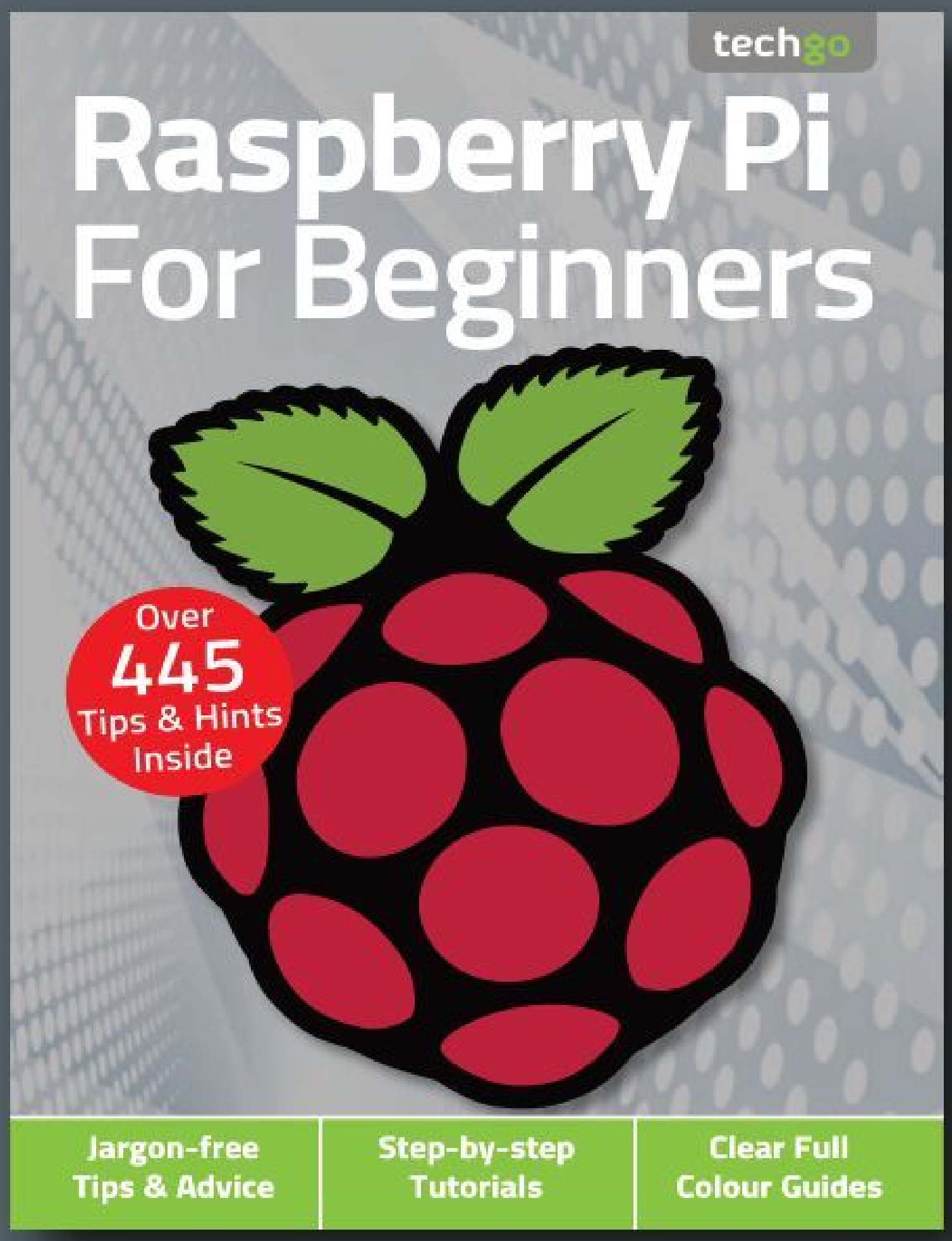
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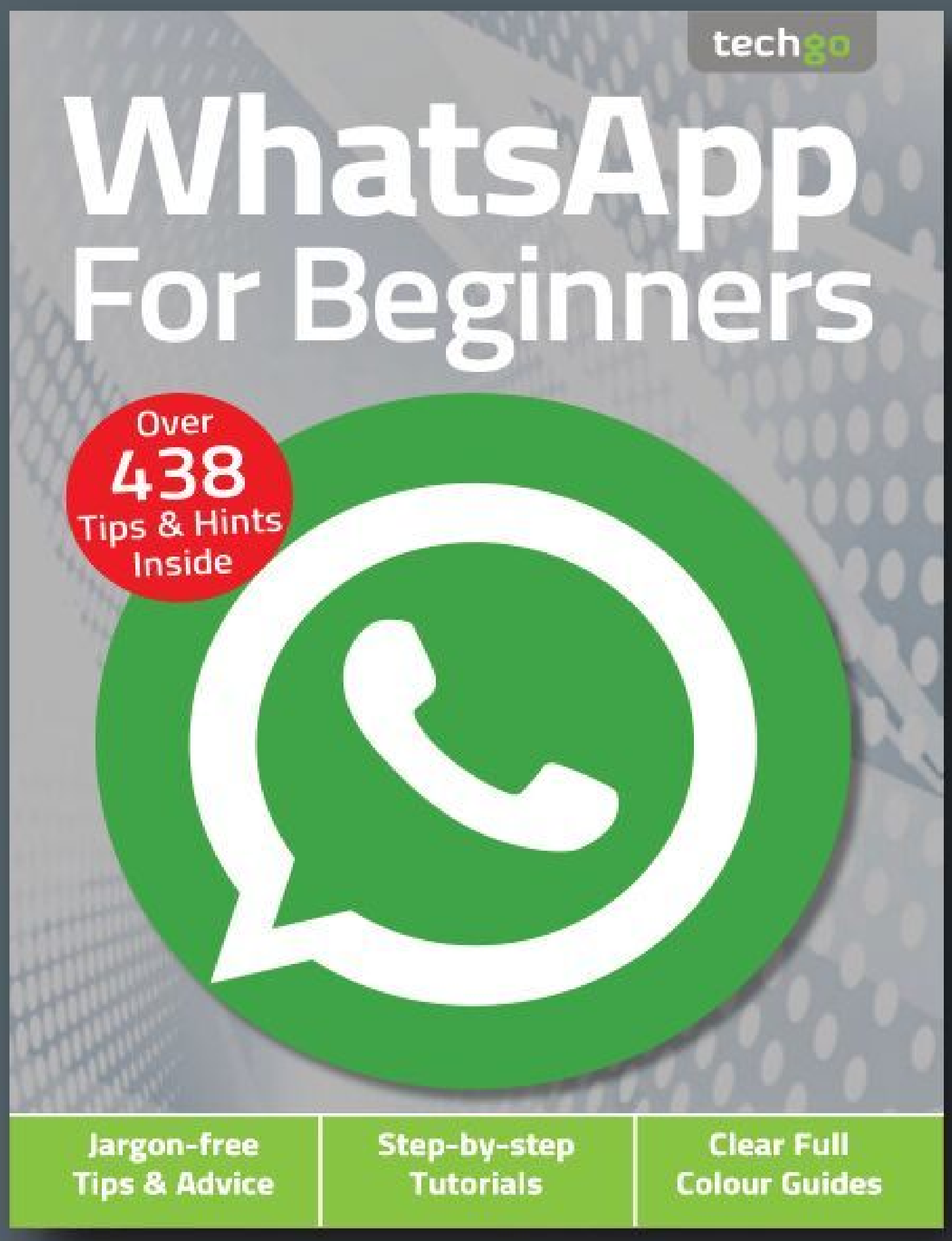
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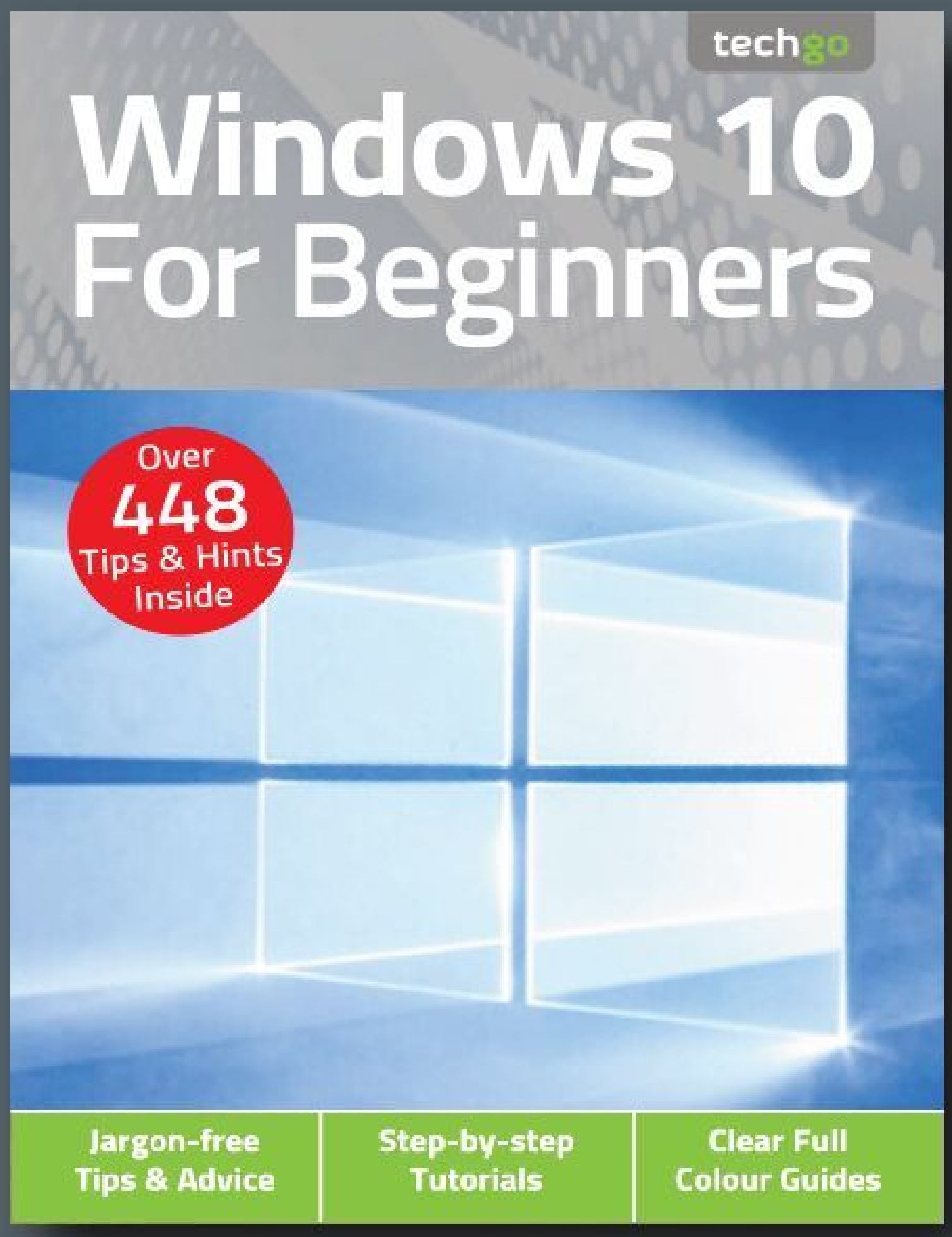
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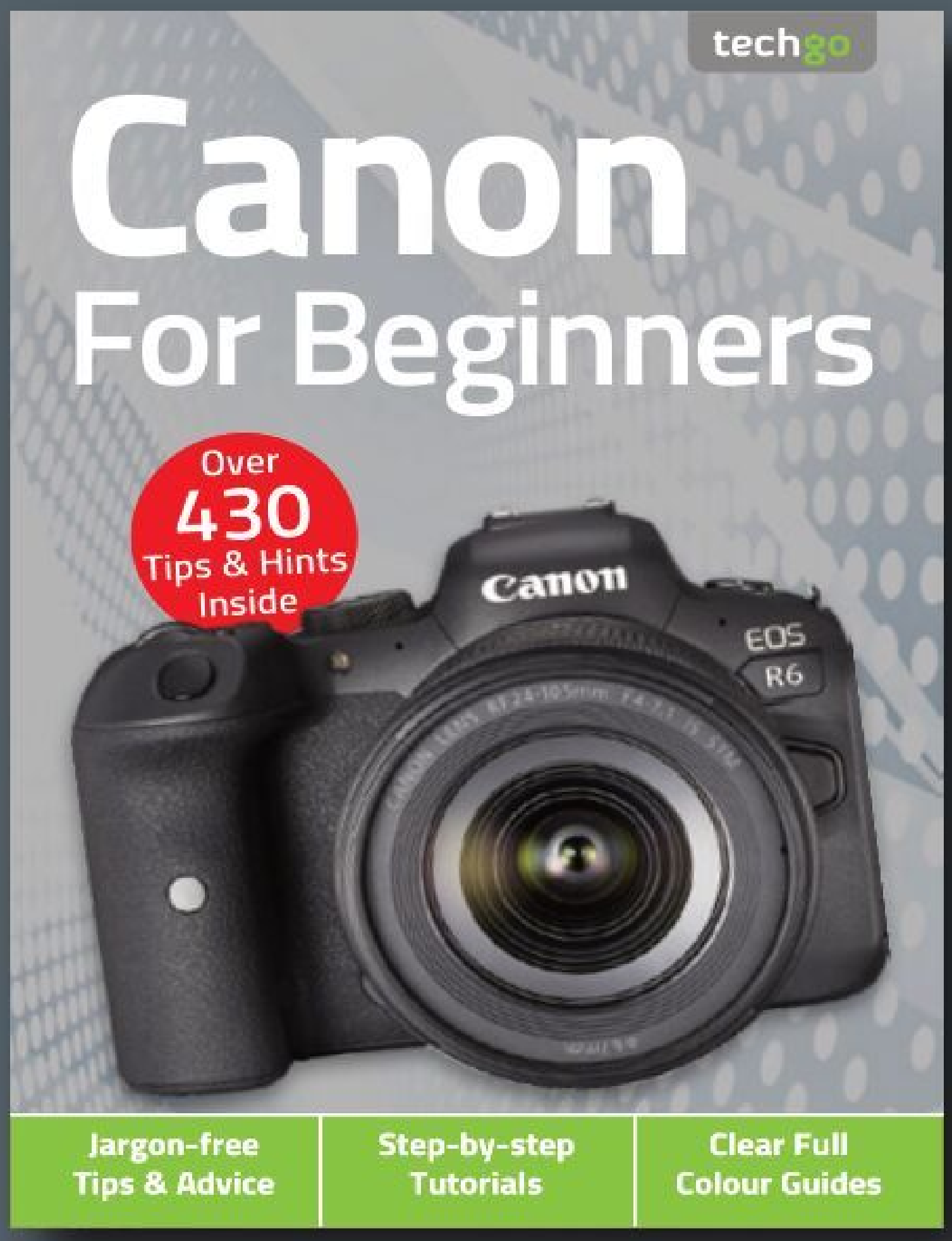
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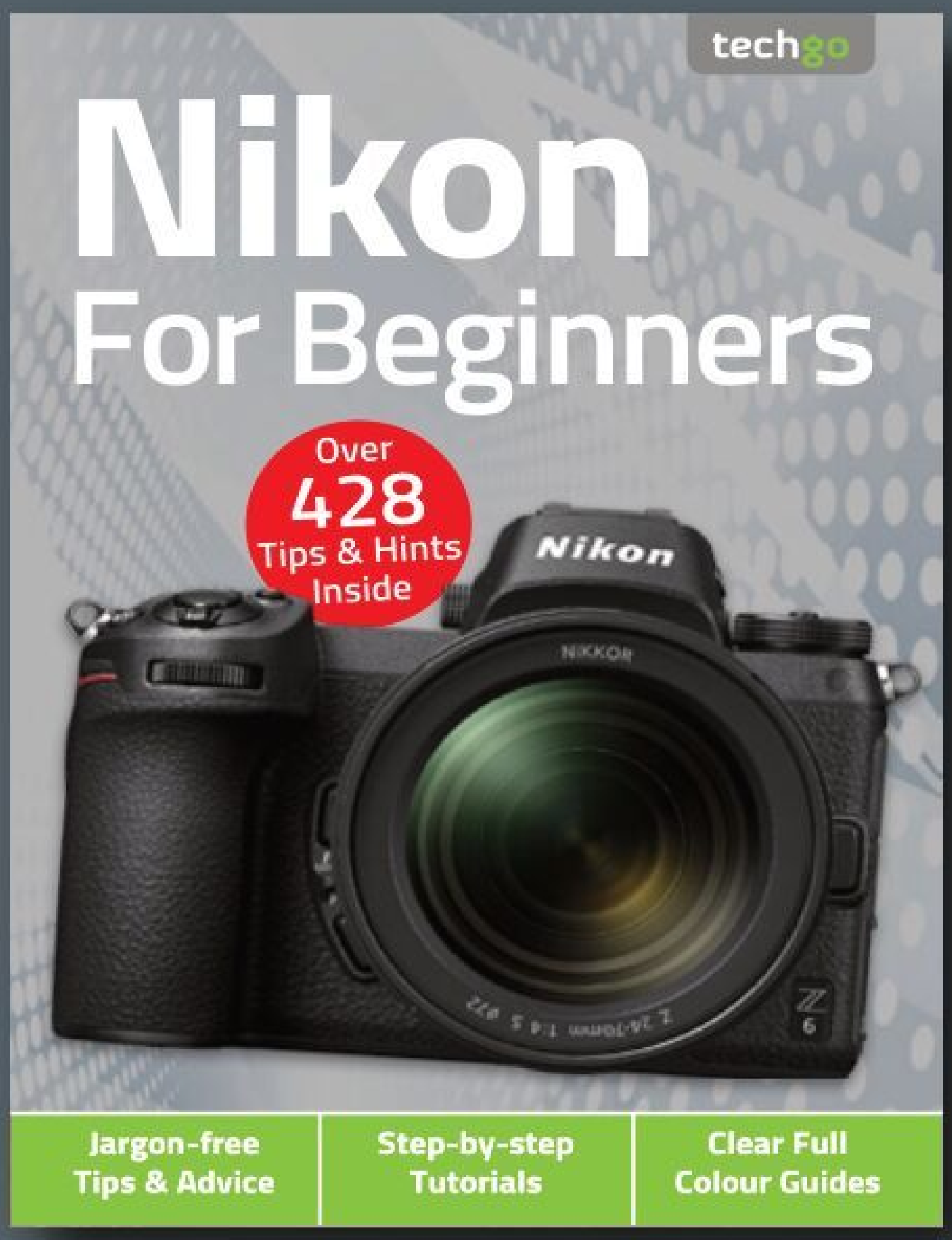
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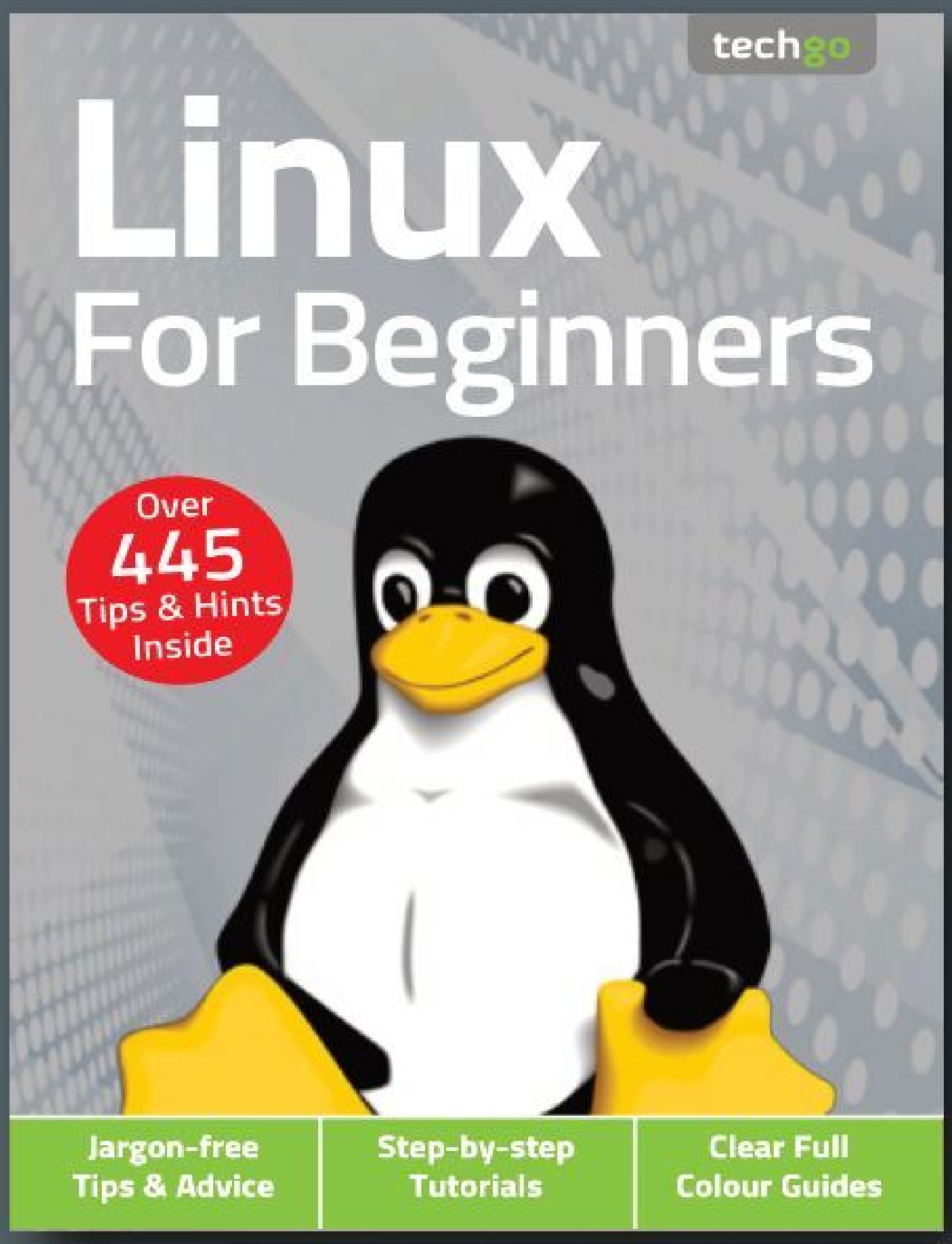
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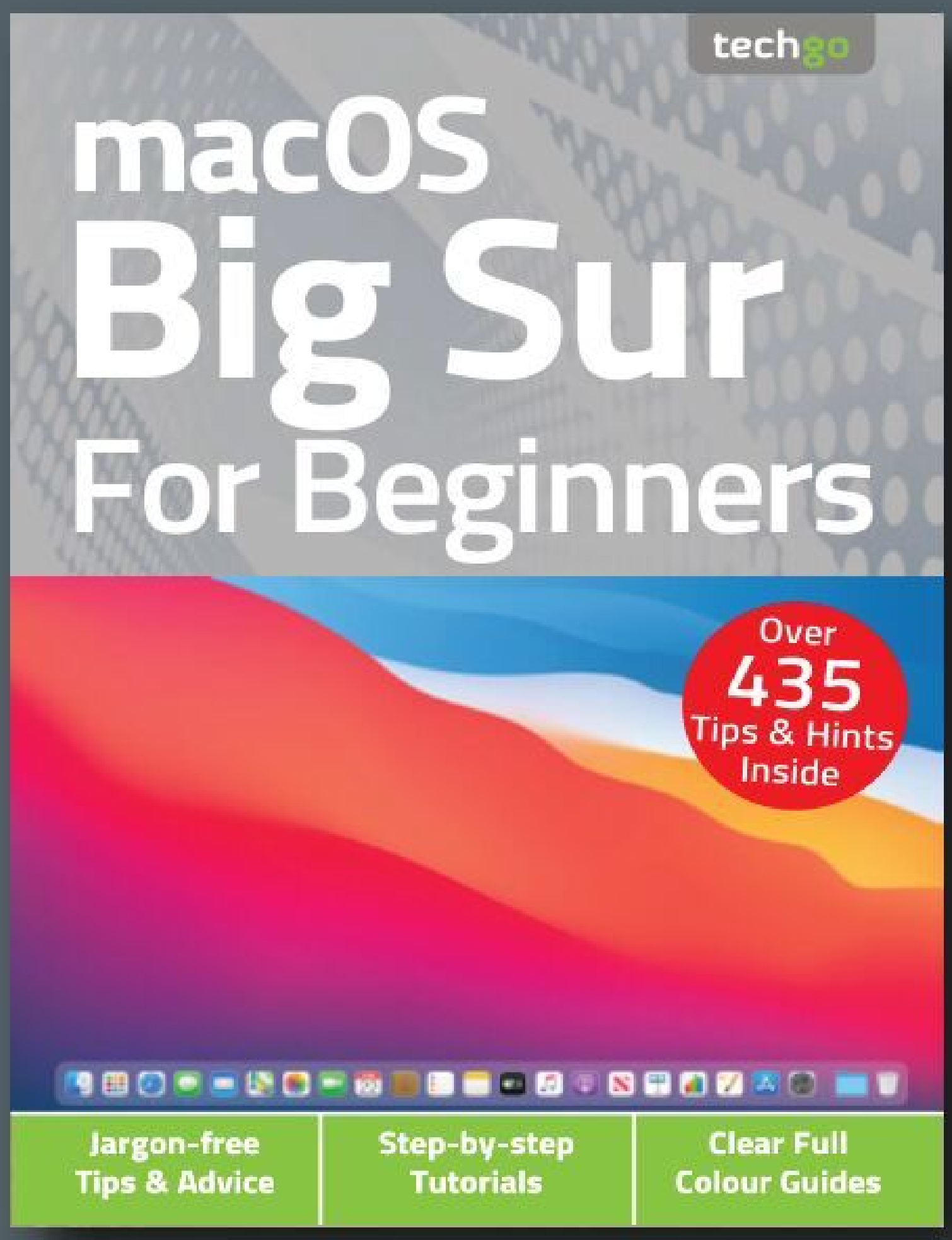
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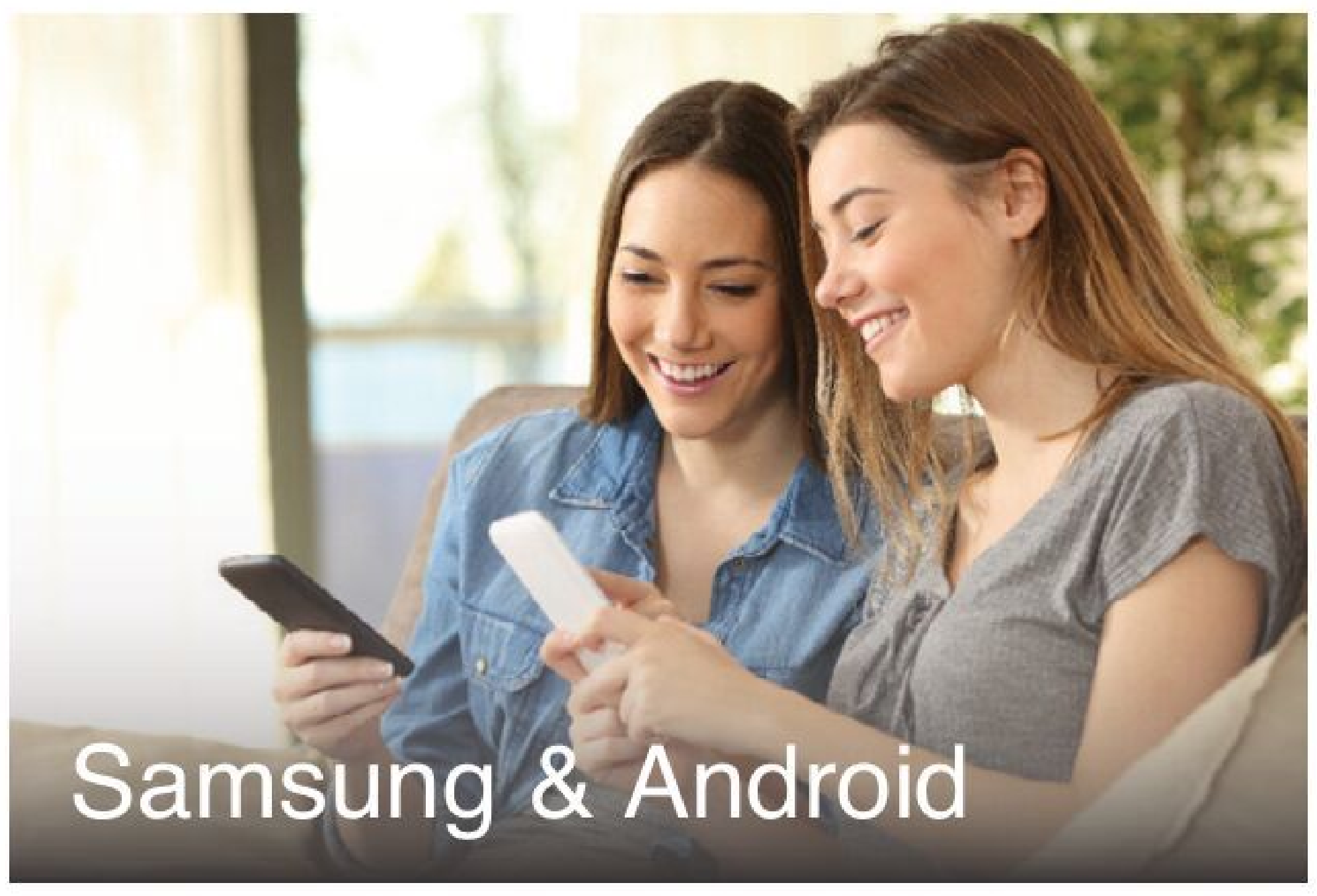

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